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Twenty years Master Plan

2014-15 to 2034-35

Zoological Garden, Thiruvananthapuram

ZOOLOGICAL GARDEN, THIRUVANANTHAPURAM

Twenty Year Master Plan
2014-15 to 2034-35

**Department of Museums and Zoos
Government of Kerala**

Zoological Garden, Thiruvananthapuram
Twenty Year Master Plan
2014-15 to 2034-35

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ZOOLOGICAL GARDEN, THIRUVANANTHAPURAM

Twenty Year Master Plan

2014-15 to 2034-35

Prepared by

B. Joseph, IFS

Director, Museums and Zoos

Department of Museums and Zoos, Government of Kerala

Signed by

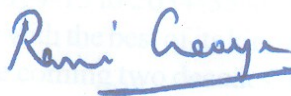


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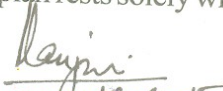


Rani George, IAS

Secretary

Cultural Affairs Department

The Twenty Year Master Plan (2014-15 to 2034-35) for the Zoological Garden, Thiruvananthapuram, is approved in the 74th Meeting of the Technical Committee held on 22.05.2015, subject to the condition that the responsibility of mobilizing financial resources for the implementation of this plan rests solely with the Department of Museums and Zoos, Government of Kerala.



Member Secretary
Central Zoo Authority
(Ministry of Environment & Forests)
Govt. of India, New Delhi



OOMMEN CHANDY
CHIEF MINISTER
KERALA



No. 817/Pre-Sec/CM/2015

05/06/2015

Message

Among the Zoos in India, the one at the Thiruvananthapuram Zoological Gardens is among the oldest and one of the most visted zoos in the country. The concept and objectives of zoos have changed from an entity for entertainment and exhibits to conservation, education and research. I am glad that the Twenty-Year Master Plan for the Zoological Garden Thiruvananthapuram prepared by the Department of Museums and Zoos will add a new dimension to its overall functioning. I hope that the proposed master plan would help the administration involved to transform the Thiruvananthapuram Zoological Gardens into one that is most admired by the visitors. I appreciate the efforts of all in the preparation of this Twenty-Year Master Plan and wish them the very best for its realization.

OOMMEN CHANDY



P.K. JAYALAKSHMI
**MINISTER FOR WELFARE OF SCHEDULED TRIBES,
YOUTH AFFAIRS, MUSEUMS AND ZOOS**



MESSAGE

I am delighted to learn that the Department of Museums & Zoos is publishing a Master Plan of Thiruvananthapuram Zoological Garden (2014-15 to 2034-35). It is also heartening to note that the Central Zoo Authority, New Delhi has approved it and the progress and activities of the Zoo for the next 20 years will be in accordance with the plan.

The Thiruvananthapuram Zoo spanning over 36 acres has the unique distinction of being the first modern zoo in the country. Over a period of time, the Zoo has made a paradigm shift from mere animal collection and exhibition to conservation, education and research. Now apart from conserving and breeding endemic and endangered species, the Zoo facilitates scientific studies and research in animal behaviour, reproductive biology, feeding & nutrition and disease control.

On this occasion I sincerely appreciate the services rendered by Shri. B. Joseph IFS in preparing the master plan and getting it approved by the Central Zoo Authority.

I hope that the new master plan on implementation will transform the Zoo in to a centre of excellence in animal conservation, education and research transforming it on par with the best of its kind in the world.

I wish this venture every success.

Thiruvananthapuram
29 June 2015

P.K. JAYALAKSHMI



RANI GEORGE
SECRETARY TO GOVERNMENT



Dated 03.06.2015

Message

Modern Zoos like the Thiruvananthapuram Zoological Garden aim to exhibit animals in naturalistic environment, while ensuring comfortable and secure habitat for them, so that the visitors would see not only the exhibited animals but also their natural surrounding to get a holistic experience on wildlife. Over the years, there has also been a policy shift on zoos in this country, with an over-arching stress on conservation, particularly of indigenous animal species and on the need to conserve these species as part of our natural heritage. This has necessitated some basic structural changes in the Thiruvananthapuram Zoo, and a comprehensive exercise in this direction was overdue.

I am happy to note that Sri. B. Joseph IFS, Director of Museums & Zoos, has undertaken this arduous task of preparing a twenty-year Master Plan, and has successfully secured the approval of the Central Zoo Authority for it. I am sure that this Plan would serve the Zoo to remodel itself, thereby amplifying its effectiveness in meeting its role as a centre of animal conservation, education and entertainment.

Rani George

Rani George IAS
Secretary, Cultural Affairs Department
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Acknowledgements

I express my sincere gratitude to Smt. P.K. Jayalakshmi, Hon'ble Minister for Welfare of Scheduled Tribes, Youth Affairs, Museums and Zoos, for her constant encouragement and valuable suggestions for formulating this Master Plan for Thiruvananthapuram Zoological Garden, Thiruvananthapuram. I also extend my wholehearted thanks to Smt. Rani George, IAS, Secretary, Cultural Affairs Department, for her staunch support and guidance in this venture.

I would like to express my sincere appreciation and thanks to Dr. Amruth, M., Scientist, KFRI, and to Dr. G. Christopher, Research Co-ordinator of MG University, for their valuable time and assistance rendered in the fulfillment of this venture.

I am deeply indebted to Sri. K. Sadasivan Pillai, Superintendent of Thiruvananthapuram Zoological Garden, for sharing with me his vast experience and knowledge of the Zoo and to Dr. Jacob Alexander, Sr. Veterinary Officer, Thiruvananthapuram Zoo, for his critical inputs and suggestions on healthcare management as well as good practices in various zoos in other countries, and to Sri. K. Gangadharan, Education Officer, Thiruvananthapuram Zoo, for his valuable inputs covering various aspects.

I would also like to extend my sincere appreciation to Sri. S. Abu, Superintendent of Natural History Museum, Smt. P. S. Manjuladevi, Superintendent of Art Museum, and Sri. G. Rajagopal, Superintendent of Botanical Garden, for their constructive suggestions on the draft plan. This Master plan would not have been made but for the valuable time and effort dedicated to it by the staff members of the Director's Office, particularly: Smt. A. Pathumma Beevi, Senior Superintendent (Retd.); Smt. R. Rajani, UDC; Kumari Deepa R.S., Head Clerk; Smt. V. Vineetha, Confidential Assistant; Sri. Satish Kumar, Computer Operator; Sri. S. Saju, Administrative Officer; and Sri. T. Sajeev Kumar, Finance Officer.

I would also like to acknowledge with thanks the wholehearted support offered by Sri. B. Sasidharan, Private Secretary to the Minister, and Sri. George Samuel, Special Secretary to the Minister, in fulfilling this endeavour.

I would like to put on record my sincere gratitude to Sri. James Zacharias, Assistant Conservator (Retd.), for guiding me in this process.

B. Joseph, IFS
Director, Museums and Zoos

Preface

THE Zoological Garden at Thiruvananthapuram has a long and proud history in animal conservation. The credit for conceiving the idea of a zoo in Thiruvananthapuram city goes to the illustrious musician-poet-visionary king Swathi Thirunal of the erstwhile princely state of Travancore. Ever since its establishment in 1857 as the second zoo in India (currently the oldest zoo in India in its original location), the Thiruvananthapuram Zoo has seen a steady progress in the number and variety of its animal collection. Even in 1890, the zoo had a 300-strong collection that included many exotic animals and boasted of a large carnivore's section that replicated the one in the famed London Zoo. The institution has been fortunate to receive continued and adequate attention and patronage even after the princely state gave way to a democratic state. To date, it remains as one of the main attractions to tourists who flock the city and the state.

Even the most glorious of institutions cannot, and must not, resist the need to move with the times, imbibing refreshing ideas and repositioning itself to be more relevant to the needs of the public that it serves. In India, the Central Zoo Authority (CZA) has been providing the menageries across the country the guiding light needed to travel with the changing times. The Thiruvananthapuram Zoological Garden too has benefited in the past from the comprehensive guidance that CZA has provided in upgrading its content and management. The last revamping exercise in the zoo was carried out in the early 1990s when it took in the features of a modern zoo.

In 1998, the government of India came out with the National Zoo Policy that clearly marked a change in the focus of animal collection and exhibition. The idea of zoos as centres of recreation and entertainment was ejected in favour of a focus on conservation, education and research. Ever since the advent of the 21st century, the management of the Thiruvananthapuram Zoological Garden has been contemplating on the ways and means by which this venerable institution could be recast as a modern-day centre for zoological (and botanical, as the campus has an impressive botanical collection) conservation, education and research, to move to a vantage point that would help it to better serve the educational and social needs of the city, the state and the country.

This Master Plan for the period 2014-15 to 2034-35 attempts to bring the Thiruvananthapuram Zoological Garden to a level that is at par with the best of its kind in the world – albeit within the limitations imposed by space and resources – in the coming two decades. It attempts to progressively propel, with reviews and course corrections as necessary, this institution towards being a centre of excellence in animal conservation, education and research.

B. Joseph, IFS
Director, Museums and Zoos

Executive Summary

THE concept of a modern zoo began with the establishment of the London Zoo in 1828. In India, the first zoo was established in Madras in 1855. The Thiruvananthapuram Zoo established in 1857 was the second. As Madras Zoo has been shifted to a new location as a new entity, the Thiruvananthapuram Zoological Garden now holds the position as the first modern zoo in the country.

Till 1947, the Zoological Garden was under the administration of princely state of Travancore and subsequently under Thiru-Kochi state till 1956. After the formation of the State of Kerala in 1956, various departments of the Government of Kerala have handled the Zoo's administration. At present, it is under the Department of Museums and Zoos.

The Zoological Garden, Thiruvananthapuram, now spreads over 36 acres, as part of a 55-acre campus that also houses museums and art galleries. In addition to a large collection of mammals, reptiles and birds in enclosures, the Thiruvananthapuram Zoological Garden has a number of free-ranging animals. The pond in the northwest side harbours a large number of amphibians and insects, as well as a wide variety of endemic and common birds.

The campus has a large number of rare endemic and exotic trees and shrubs, besides a medicinal plant garden with a number of rare species. An Orchedarium with many endemic, prized species from the Western Ghats are among the other attractions in the campus.

Since its establishment, the Thiruvananthapuram Zoological Garden has undergone a number of developments. Currently, the Animal Section has 689 inmates in 27 species of mammals (424 individuals), 57 species of birds (190 individuals) and 20 species of reptiles (75 individuals). A Butterfly Park on an area of 1,000 sq.m. is another attraction. The Animal Section is under the charge of a Superintendent, who is assisted by a Curator and a Biologist.

The Zoo Hospital dominates the Veterinary Section, which has one full-time Senior Veterinary Officer one temporary Veterinary Officer. The Zoo Hospital has an air-conditioned operation theatre, a pharmacy, a sterilization room, a laboratory, facilities for X-ray and ultrasound scanning, in-patient treatment wards, a small quarantine facility, a documentation unit, artificial egg incubation and brooding facility, and a post-mortem examination room. The hospital stocks all essential tranquilizing equipment, and all important hospital sections are fitted with monitoring cameras with night vision and recording facilities.

The Stores and Feed Supply Section is directly supervised by the Zoo Superintendent and the quality of the food is thoroughly verified and approved by the Veterinary Officer. Under their guidance and supervision, the food is prepared by two staff members. A store attendant is employed to allot the daily required quantity of food material as approved by the officers. All the food stuff purchased from the open market is decontaminated before supplying to the inmates. The Section has all essential equipment required for measuring, mixing, dispensing and transporting food materials for the Zoo inmates.

The Thiruvananthapuram Zoological Garden does not have a full-fledged Engineering Section, and all major works are outsourced to various government agencies.

As the Zoo is located inside the museum premises and access to it is only through the main entrance gate of the museum, round-the-clock security is available for the zoo. Security guards are posted inside the Zoo to hold a vigil over the Zoo premises. A Police Station located just outside the eastern entrance of the museum complex and the services of a Police Aid Post with 11 policemen are available inside the complex round the clock. A high perimeter wall topped with barbed wire protects the Zoo from break-ins. A surveillance camera system is being installed to monitor the movement of visitors, animal behaviour and other activities.

The Kerala Water Authority is the main supplier of potable water to the Zoological Garden. The zoo campus also has two lakes, one small and one large. Water from the large lake is used for gardening and primary cleaning of cages. Apart from this, the Zoo also has a sheltered open well with potable water.

Sanitation is largely looked after by the Animal Section. Solid waste materials such as leaf litter and leftover food materials are sent out of the zoo premises for proper disposal. An agency is appointed for this. Other solid and semi-solid substances like dung and faecal matter are used in the vermicomposting unit. Non-biodegradable items are sold in bulk to recycling units or sent out of the zoo campus for disposal through a private agency. The Thiruvananthapuram Zoological Garden is declared as a “plastics-free zone” by the Government of Kerala.

Being an all-weather zoo, the Thiruvananthapuram Zoological Garden attracts a large number of visitors from all over India and other countries throughout the year. The number of visitors has been increasing year by year. The Zoo has been provided with various visitor amenities, such as drinking water points, toilets, vehicle parking area, wheel chairs, electric carts, souvenir shop, etc.

The Thiruvananthapuram Zoological Garden regularly organizes one-day awareness camps for students of various schools in and around the city. In addition, the Education Officer regularly addresses the school and college students who visit the Zoo, besides conducting outreach activities. A very successful programme called “Introduction to the World of Flying Jewels” is conducted by the Zoological Garden to introduce the children to the world of butterflies. The institution also provides platform to various non-governmental and animal-friendly organizations to conduct nature education classes and awareness programmes.

The Thiruvananthapuram Zoological Garden carries out an animal adoption programme with the help of various institutions and non-governmental organizations. The programme is slowly becoming popular. The persons or organizations that take part in the adoption programme receive various benefits.

THE primary objectives of a Zoological Garden are to undertake ex-situ conservation of species and to supplement the efforts for the in-situ conservation of species. The ex-situ conservation facility should have an animal collection and breeding plan and integrate the theme of Biological Park with the co-existence of plant and animal species. A zoo’s conservation efforts should support not only the conservation of endangered species but also their natural habitat and ecosystem.

The National Zoo Policy of 1998 highlights a shift in the policy of animal collection and exhibition from unlimited animals with limited facilities to limited animals with adequate facilities. The shift is aimed at conservation, education and research as opposed to mere recreation and entertainment. Keeping this in view, the objectives of the Thiruvananthapuram Zoological Garden have been reframed as follows:

- To conserve and breed animals endemic to and endangered in the Western Ghats for the preservation of biodiversity, exchange of bred animals with other zoological parks, as well as

their re-introduction to the wild strictly adhering to prescribed norms.

- To facilitate the conduct of scientific studies and research in animal behaviour, reproductive biology, feeding and nutrition, and diseases and their control. Information so acquired will then be disseminated to other zoological parks in India and around the world.
- To provide facilities for nature education and awareness creation on the need for wildlife conservation among the public, with special attention to the younger generation.
- To develop the institution as a training centre for the management of wild animals and their upkeep, offering veterinarians and scientists the opportunity to take advantage of the experience that the institution has gathered in the captive management of wildlife.

Being located in one of the centres of endemism and global biodiversity hotspot, the Western Ghats, the Zoo was and is expected to function as a centre of conservation breeding of endemic and threatened species. The Thiruvananthapuram Zoo had achieved success in captive breeding from its inception. It now actively participates, together with Arignar Anna Zoological Park (Chennai), in conservation breeding programme of lion-tailed macaque. It has also started a conservation breeding programme on Gangetic Gharial.

Certain species of animals are endemic to the southern part of India, but are not featured in the Thiruvananthapuram Zoo's existing collection of animals. Steps need to be taken for the procurement of these animals. The collection plan for animals that are endangered and endemic to this part of the country will continue. These animals can be exchanged with other zoological parks in India and abroad.

The Thiruvananthapuram Zoo has already formulated an animal collection and breeding plan, which covers 23 species of mammals, 20 species of birds and 14 species of reptiles. While this plan includes exotic ones, emphasis will be given to local and regional animals of the Indian sub-continent. With its large naturalistic enclosures and theme-based designs, the Thiruvananthapuram Zoological Garden has many features of a modern zoo with a 21st century vision. This would be maintained, and efforts will be made to make the Zoo more modern. A zone-based Master Layout Plan has been already designed with the assistance of the Central Zoo Authority.

An appraisal of the current status of the Thiruvananthapuram Zoo has brought out a number of inadequacies, which need to be remedied to upgrade its content and management. The measures proposed include:

- Construct new enclosures as per the approved Master Layout Plan;
- Provide proper concealed animal houses and day kraals for carnivores, and construct detachable cage-like passages so that carnivores can be moved between cages and open enclosures;
- Relocate animal houses further away from visitors' gallery and conceal them by planting suitable hedge plants and trees;
- Restrict future selections of new Animal Keepers to candidates who have completed the Certificate Course on Animal Handling in Zoos and Forests, conducted by the Kerala Veterinary and Animal Sciences University;
- Construct nocturnal animal display areas in consultation with the Central Zoo Authority;
- Modernize the Zoo Hospital with installation of latest equipment, and construct another hospital block near the present hospital;

- Install cameras and video recorders in the Zoo Hospital for digital documentation;
- Commission the Public Works Department to construct a state-of-the-art quarantine facility;
- Establish a separate hand-rearing section for raising orphaned and neonatal animals;
- Procure an ambulance to transport the injured and sick animals within the Zoo campus, as well as to transport stray, injured or orphaned wild animals from nearby forest areas on request from the Forest Department and the public;
- Establish a proper facility for research and documentation, along with a supporting library, in the Zoo Hospital;
- Modernize the post-mortem room with suitable equipment and repository for keeping samples;
- Install a hydroponics unit to produce the required quantity of uncontaminated grass in the zoo itself so as to reduce the chances of spreading of diseases;
- Build up an Engineering Section with the services of a qualified engineer, supported by other staff such as Work Supervisor and Draftsman;
- Provide improved visitor facilities, including more resting places;
- Provide sufficient number of waste bins and an effective waste disposal plan; and
- Increase the number of critical staff.

Keeping in mind the developmental requirements of the Zoo for the next 20 years, more posts need to be created to better staff the Zoo. Even in the present scenario, the Zoo is facing an acute shortage of permanent staff. Besides, there is a tendency among the staff appointed on permanent basis to leave the department for better pastures. This issue needs to be viewed very seriously and remedial measures taken immediately.

The total plan expenditure over 2014-15 to 2034-35 is ₹ 319 crore. The planned work will be taken up in phases, starting with a five-year period. The Central Zoo Authority's generous assistance is expected in meeting the requirement for financial resources. The rest of the amount has to be met from State Government's exchequer.

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PART 1

1 Introduction

1.1 History

THE concept of a modern zoo began with the establishment of the London Zoo in 1828. In India, the first zoo was established in Madras in 1855. The Thiruvananthapuram Zoo established in 1857 was the second. As Madras Zoo has been shifted to a new location as a new entity – Anna Arignar Zoological Park – the Thiruvananthapuram Zoo now holds the position for the first modern zoo in the country.

Swathi Thirunal Maharaja (1816-1846), the illustrious king and music composer who ruled the Kingdom of Travancore during 1830-1846, is credited as the visionary behind the establishment of the Thiruvananthapuram Zoo. Immediately on his assumption of power, Swathi Thirunal modernized the horse breeding establishment at Thovalay and some fine mares were procured. The best elephants from the Kingdom's forest department as well as other places were selected and attached to this establishment. A menagerie was incorporated into the stables at Thiruvananthapuram to house royal Bengal tigers, panthers, cheetahs, deer and boars. A lioness, which had been imported from Africa into the French settlement at Mahe, was purchased and added to the collection of animals at this zoo, besides many kinds of indigenous and exotic birds. Swathi Thirunal thus created the nucleus for the modern zoo. It was, however, left to his brother Uthram Thirunal Marthanda Varma Maharaja and the then British resident William Cullen to formally establish the modern zoo at Thiruvananthapuram in 1857.

During 1880-1890, the housing facilities of animals were modernized. A magnificent house for the larger carnivores was constructed as an exact replica of the one at the London Zoo. The number of zoo inmates had reached 300 at this time, with animals such as orang-utan, Malayan tapir and rhinoceros among the collection.

As the number of animals kept has kept increasing steadily, more space had to be found to construct new enclosures for the animals. The Government of Kerala acquired 5 acres on the northern side of the existing zoo in the year 1998. The Zoological Garden, Thiruvananthapuram, now spreads over 36 acres, as part of a 55-acre complex that also houses museums and art galleries.

1.2 Location

The Zoological Garden is located in the heart of Thiruvananthapuram city, just 3 km away from the main bus and railway stations, and 10 km and 6 km away from the domestic and international airports, respectively. Regular bus services connect these places with the Zoo. On an average, close to 10,00,000 people visit the Thiruvananthapuram Zoo annually.

1.3 Climate

Thiruvananthapuram enjoys a warm tropical climate with the day-time temperature seldom exceeding 34°C and night-time temperature rarely dropping below 23°C. The area has predominantly two seasons – summer season and the rainy season. Besides the two rainy seasons – the Southwest Monsoon from June to September and the Northeast Monsoon from October to November – Thiruvananthapuram also gets summer rains as well as pre-monsoon showers between January and May. The average rainfall is about 180 cm. The proximity to the Arabian Sea makes the climate moderate throughout the year.

1.4 Flora

The Zoological Garden campus has a large number of rare endemic and exotic trees and shrubs. The main attraction of exotic species is *Adansonia digitata* (Baobab) and *Couroupita guianensis* (Cannonball Tree), while the endemics include *Sterculia alata* (Buddha Coconut Tree), *Sterculia urens* (Gum Karaya) *Toona cilita* (Indian Cedar), *Butea monosperma* (Flame of the Forest), *Diospyros ebenum* (Indian Ebony) and *Santalum album* (Indian Sandalwood). Some of these are more than a century old. There is a medicinal plant garden with a number of rare species like *Alangium salvifolium*, *Asparagus sp.*, *Kaempferia galanga*, *Rauwolfia serpentina*, *Strychnos nux vomica*, *Gmelina arborea*, *Cinnamomum camphora*, etc. A well maintained Orchedarium with many rare and endemic species of the Western Ghats are among the attractions on the campus. (A list of trees and shrubs is appended as Annex 1).

1.5 Fauna

In addition to a large collection of mammals, reptiles and birds in enclosures, there are free-ranging animals like palm civet, common mongoose, bat, squirrel, etc. in the Zoo. The lake area in the northwest side harbours a large number of amphibians and insects, as well as a wide variety of endemic and common birds like darter, heron, peafowl, moorhen, pigeon and parakeet, apart from many migratory birds. The lake is also a habitat to several endemic fish species.

1.6 Pollution

The only source of pollution is the emissions from the exhaust gases from the vehicular traffic around the zoo campus. Even this is mitigated by the large number of trees in the campus, which serves as the green lungs of the city.

2 Objectives

THE Zoological Garden, Thiruvananthapuram, has the following objectives:

1. To conserve wildlife with special emphasis on the species endemic and endangered in the Western Ghats, provide education and awareness on nature, and support eco-tourism.
2. To initiate captive breeding programme for endangered species in accordance with the established protocols, and to rehabilitate such captive-bred species in the wild if necessary.
3. To provide opportunities for the conduct of scientific studies on the fauna to enhance our knowledge on animal behaviour, its biology, ecology, etc., so as to aid in scientific management of the zoo and conservation of wildlife.

Being located in one of the centres of endemism and global biodiversity hotspot, the Western Ghats, the Zoo was and is expected to function as a centre of conservation breeding of endemic and threatened species. From its inception, the Thiruvananthapuram Zoo had achieved success in captive breeding. Captive breeding has now given way to conservation breeding and the Zoo has been successful in breeding large mammals as well as several bird species.

The Thiruvananthapuram Zoological Garden, together with Arignar Anna Zoological Park (Chennai) actively participates in conservation breeding programme of Lion-tailed Macaque (*Macaca silenus*). It has also started a conservation breeding programme on Gangetic Gharial (*Gavialis gangeticus*).

Certain species of animals are endemic to the southern part of India, but are not featured in the Thiruvananthapuram Zoo's existing collection of animals. Steps need to be taken for the procurement of these animals. The collection plan for animals that are endangered and endemic to this part of the country will continue, and these animals could be exchanged with other zoological parks in India and abroad. The Thiruvananthapuram Zoo has already formulated an animal collection and breeding plan, which covers 23 species of mammals, 20 species of birds and 14 species of reptiles. While this plan includes exotic ones, emphasis will be given to local and regional animals of the Indian sub-continent. With its large naturalistic enclosures and theme-based designs, the Thiruvananthapuram Zoological Garden has many features of a modern zoo with a 21st century vision. This would be maintained, and efforts will be made to make the Zoo more modern.

3 Current Status: An Appraisal

SINCE its establishment in 1857, the Thiruvananthapuram Zoological Garden has undergone a number of developments. An account of the current enclosure-wise position and proposed enclosures is presented below.

3.1 Lion-Tailed Macaque Enclosure

This enclosure was built in 2002. There is an open paddock that covers an area of 990.77 sq. m. and surrounded on the viewer's side by a dry moat. The animal house covers an area of 52.9 sq. m. and has five cages. There is an open covered kraal attached to the animal house. A troop of five patrols the open area.

3.2 Indian Bison (Gaur) Enclosure

This proposed site covers an area of 1,859.37 sq. m., with an animal house of 84.43 sq. m. The existing old building on the site, which is currently being used for housing King Cobras, will be modified as the day shelter for Gaur.

3.3 Bonnet Macaque Enclosure

This enclosure was inaugurated along with the Lion-tailed Macaque enclosure in the year 2002. The open paddock area is 961.62 sq. m. and the animal house has an area of 43.33 sq. m.

3.4 Malabar Gray Hornbill Enclosure

In 2002, an enclosure was constructed for housing Capuchin monkeys. This enclosure has an open area of 716.62 sq. m. and is surrounded on the viewer's side by a dry moat. The animal house that covers an area of 43.68 sq. m. has four cages. The plan is to suitably modify this enclosure to exhibit Malabar Grey Hornbill.

3.5 Malabar Giant Squirrel Enclosure

As area of 401.46 sq. m. with an animal house of 40 sq. m. area is identified, just beyond the Malabar Grey Hornbill enclosure, to exhibit Malabar Giant Squirrel. The work has already commenced in accordance with plan approved and sanctioned by the Central Zoo Authority (CZA).

3.6 Peafowl Enclosure

An area measuring 745.34 sq. m. beside the old primate house is proposed to house the peafowl.

3.7 Primate Interpretation Centre

The Primate Interpretation Centre is to be located in a heritage structure that was built in 1857. The enclosures, which currently house pheasants and parakeets, will be suitably modified for the purpose.

3.8 Common Langur Enclosure

This enclosure built in 2003 has open area of 1,099.84 sq. m., and an animal house of 62.23 sq. m. with four cages. There is a viewing glass window provided on the wall adjacent to the wet moat, which surrounds the viewing area of the enclosure. At present, four langurs are housed in the enclosure.

3.9 Owls Enclosure

The existing cages of White Breasted Sea Eagle, Bengal Vultures and Cinerous Vulture will be demolished and a new enclosure with an area of 836.60 sq.m. constructed for housing owls.

3.10 Terrestrial Aviary

This is a very old and dilapidated structure that covers an area of 348.93 sq. m. Very little sunlight enters in most cages. This is marked to be demolished for a new aviary that will be set up over an area of 1,241.52 sq.m. (This is discussed in detail in Part 2 of the Master Plan.)

3.11 Birds of Prey Enclosure

Most fish-eating birds are housed in a new aviary that has been constructed. This aviary has a pool, perches and nest boxes at various locations. The floor is landscaped, complete with a waterfall that flows into the pool. The aviary covers an area of 287.96 sq. m. and is covered all around with link mesh and is rodent-proofed. The pool is stocked with fry, as live prey for the birds.

The present Gharial and Spectacled Caiman cages, which measure about 804.202 sq.m. and is adjacent to this enclosure, will be demolished and modified as part of the Birds of Prey enclosure.

3.12 Aquatic Aviary

The existing lake in the zoo with an area of 1,823.89 sq.m. will be covered and modified into a new aquatic aviary to house the aquatic birds and storks.

3.13 Niligri Langur Enclosure

This enclosure was built in 2003, along with the Common Langur enclosure. It has an open area of 1,062.04 sq. m., and the animal house covers an area of 62.09 sq. m. and has four cages. A wet moat surrounds the viewing area of the enclosure. Only two animals are housed in the enclosure at present and they are not breeding. More animals would need to be acquired to facilitate the breeding programme.

3.14 Conservation and Breeding Centre for Lion-tailed Macaque

The animal house in this enclosure has three cages and a retrieval area. This enclosure was originally constructed in 2004 to house chimpanzees. However, as chimpanzees did not become available, it was decided to be used as conservation and breeding centre for Lion-tailed Macaque. It has an open area of 1,190 sq.m. and an animal house of 62 sq.m.

3.15 Sloth Bear Enclosure

This enclosure built in 2003 has an open area of 648 sq. m. and the four-cage animal house covers an area of 67.56 sq. m. It has a dry moat all along the viewing area. However, the terrain is highly inclined, making viewing of the animal very difficult. Therefore, the open enclosure needs to be landscaped to provide easy viewing.

3.16 Himalayan Black Bear Enclosure

This enclosure, which was built in 2003, has an open paddock area of 64.29 sq. m. The 48.26 sq. m. animal house has three cubicles, and a dry moat runs along the viewing area. The open paddock has a wallowing pool and a cave. This enclosure terrain is also very steep and needs to be landscaped/modified to make animal viewing more easy.

3.17 Water Monitor Lizard and Turtles

The proposed Otter enclosure with an area of 345.81 sq. m. will be modified to house Water Monitor Lizards and Turtles.

3.18 Lion Enclosure

The animal house in the Lion enclosure has four cages, one squeeze cage and an open kraal, covering an area of 91.33 sq. m. There is also an open area measuring 3,184.99 sq. m with a dry moat separating the enclosure from the viewing area. This is a very large enclosure and it is often difficult to sight the animals, so this enclosure could be divided into two and make optimum use of, as discussed in detail in Part 2 of this Master Plan. This enclosure also has two pools.

3.19 Hippo Enclosure

The enclosure for Hippopotamus was built in 2002 and has a pond and a waterfall. The enclosure is surrounded by a dry moat that separates the viewing area. The enclosure covers an area of 1,916.58 sq. m. The animal house has two cubicles and one retrieval area.

3.20 Rhino, Sambar Deer, Swamp Deer and Spotted Deer Enclosure

The existing Rhinoceros, Elephant and Sambar Deer enclosures will be combined and modified to form a multi-species exhibit enclosure for Rhinoceros, Sambar Deer, Swamp Deer and Spotted Deer. This modified enclosure will span an area of 8,939.78 sq.m. and will have animal houses that measure 173.71 sq. m.

3.21 Giraffe Enclosure

This enclosure, which was readied in 2008, features an open paddock of 1,664.32 sq. m. and an animal house of 95.76 sq. m. having two cubicles. As there are no trees in this enclosure, the giraffe will have to stay confined to the animal house during hot days. This issue needs to be addressed. There is only one male giraffe in the enclosure at present. Steps needs to be taken so that a mate can be provided for this animal.

3.22 Sambar Deer (Off-Exhibit) Enclosure

The proposed Sambar Deer (off-exhibit) enclosure has an area of 2,380.50 sq.m. and is located towards the northern end of the Zoo boundary.

3.23 Rhesus Macaque Enclosure

An area of 785.98 sq.m. with an animal house of 68.78 sq.m. is proposed near the existing Cape Buffalo enclosure for housing Rhesus Macaques.

3.24 Spotted Deer (Off-Exhibit)

The proposed Spotted Deer (off-exhibit) enclosure covers an open area of 1,360.25 sq.m. with an animal house of 44.42 sq.m. Currently, Cape Buffaloes are housed here, and they will be shifted to their original enclosure where Gaur is housed. Gaur will be shifted to the newly proposed Western Ghats site.

3.25 Blackbuck Enclosure

This enclosure has an open paddock area of 2,693.76 sq. m. and an animal house of 29.36 sq. m. A dry moat surrounds this enclosure on two sides. Being on a slope, there is no problem of water logging in this enclosure. Blackbucks are very sensitive animals and can get excited at the slightest provocation. Keeping in mind this problem, the viewing area of this enclosure is also limited.

3.26 Cape Buffalo Enclosure

There is an open area of 2,069.20 sq. m., and an animal house with a squeeze cage covering an area of 91.07 sq m. A wallowing pool is provided in the open enclosure and four cubicles in the animal house. This enclosure is surrounded on three sides by a dry moat. Many trees in the open paddock area provide the necessary shade for the animals.

3.27 Zebra Enclosure

This enclosure was inaugurated in 2006. It has a paddock area of 893.96 sq. m. The animal house has four cubicles and covers an area of 86.11 sq. m. There is a viewing area on the roof of the animal house with a lawn in front. The paddock area can be extended backwards when more animals have to be housed. Only one female Zebra features in the collection currently. Immediate measures need to be taken to add more animals to the collection.

3.28 Jaguar Enclosure

An area of 743.99 sq.m. is demarcated near the Zebra enclosure, where Hyenas were earlier housed, to construct a Jaguar enclosure.

3.29 Leopard Enclosure

This is a dome-shaped enclosure completely covered with link mesh. The open paddock area is 411.09 sq. m., with a waterfall and a cave in it. There is also a loft provided, on to which the animals can climb. The animal house has four cages including a squeeze cage and covers an area of 55.09 sq. m. There is an open kraal adjacent to the animal house of this enclosure.

3.30 Carnivora Interpretation Centre

The present carnivora cages are more than 152 years old. This structure will be modified as a Carnivora Interpretation Centre.

3.31 Tiger Enclosure

This is the old open carnivore enclosure in the Thiruvananthapuram Zoo and was built in 1962. Construction of a new animal house with three cages, including a squeeze cage, is fast nearing completion. The old animal house may then be modified and this enclosure can be divided into two. This matter is discussed in detail in Part 2 of the Master Plan.

3.32 Hog Deer & Nilgiri Tahr Enclosure

This enclosure has been specially designed with lots of mounds and rocky areas. The animal house has an area of 29.60 sq. m. and an open area of 2,600 sq. m. At present, only Hog Deer is housed here; there is no Nilgiri Tahr in the animal collection of the Thiruvananthapuram Zoo. Priority should be given to collect these animals to facilitate the captive breeding programme of this species, which is endemic to Western Ghats.

3.33 Hyena Enclosure

At present, the animal house in the Barking Deer enclosure is old and dilapidated. It has an area of 14.50 sq. m. and an open paddock area of 717.2 sq. m. The open paddock area is proposed to be extended backwards till the drainage line to acquire more space for Hyena enclosure.

3.34 Jackal Enclosure

An area of 925.27 sq. m., after the Hyena enclosure and a green belt area, is identified for constructing a new Jackal enclosure.

3.35 Porcupine Enclosure

The 45 sq. m. Porcupine enclosure has a cave and a concrete floor. However, this enclosure is not scientifically designed and hence needs to be demolished and a new enclosure constructed to house porcupine.

3.36 Blue Bull (Nilgai) Enclosure

The enclosure covers an area of 1,211.64 sq. m. The open paddock area may be extended backwards up to the drainage line to acquire more space, and the animal house constructed on the back side with separate cubicles.

3.37 Barking Deer Enclosure

Adjacent to the Blue Bull enclosure, there would be a patch of green buffer and an area of 910.65 sq. m. is demarcated for the construction of Barking Deer enclosure.

3.38 Small Mammal Enclosure (Jungle cat, Civet cat and Toddy cat)

The small mammal enclosure covers an area of 937.06 sq. m. The cages are very old and are not designed scientifically. This enclosure will be therefore demolished and rebuilt during the second phase of constructions under the Master Plan Layout approved by CZA.

3.39 Exotic Birds Enclosure

A row of 15 bird cages are modified to house the newly arrived exotic birds. These cages extend over an area of 602 sq.m.

3.40 Emu Enclosure

The existing Spectacled Caiman enclosure will be demolished and a new enclosure for Emu with adequate facilities constructed on an area of 644.70 sq. m.

3.41 Rhea Enclosure

The existing Ostrich enclosure will be used for housing white and brown Rhea. The area will measure 726.98 sq. m.

3.42 Butterfly Park

A Butterfly Park proposed to be established behind the reptile house, as there is sufficient number of host plants in the area for attracting various species of butterflies. The park will spread over an area of 898.06 sq. m.

3.43 Reptile House

The Reptile House inaugurated in 2008 has 14 enclosures. Each enclosure has been provided with a retrieval area/cage. Pools are provided in six enclosures. The enclosures are constructed in such a way so that they simulate natural habitats for different snake species. The roof of the reptile house has been covered with green shade net and creepers are grown on it to regulate temperature inside the enclosures. Enclosure enrichments are not up to the mark at present and can be improved greatly. Temperatures inside the reptile house needs to be monitored constantly and adequate measures should be taken to bring it down if it crosses desired limits. Installation of showers inside the enclosures can be considered. More high-powered exhaust fans have to be installed in the Keepers' gallery. Fans will also be provided in the viewing area to regulate the temperature there.

3.44 Crocodile Complex

The crocodile complex has four tanks with basking areas to accommodate four different crocodile species. The two viewing galleries are designed in such a way that the animals can be seen even when they are under water. A water treatment plant should be installed so that the water used in this enclosure may be recycled. Some enclosures are too large and may be divided into two or three parts.

3.45 Green Buffer

The existing Spotted Deer enclosure will be transformed and left as a green buffer.

3.46 Vermicompost Plant

An area has been identified between the Zoo lake and Rhinoceros enclosure for the construction of a vermicompost plant.

3.47 Post-mortem Room

A new post-mortem room is proposed to be constructed in place of the existing old building. The new facility would occupy an area of 150.39 sq.m.

3.48 Burial Ground

The burial ground encloses an area of 190.51 sq.m. towards the western end of the Rhinoceros enclosure, near the Zoo boundary.

3.49 Zoo Store-cum-Office Complex

A new building for Zoo store and office with an area of 294.42 sq. m. and all modern facilities is proposed.

3.50 Zoo Hospital, In-patient Ward and Quarantine Facility

The Zoo Hospital at the Thiruvananthapuram Zoological Garden and the new In-patient Ward were constructed in the year 2000. Besides the ward, the hospital has an operation theatre, a clinical laboratory and X-ray facility. The new In-patient Ward has twelve cubicles including a squeeze cage. There are two covered and one open kraal. The old Zoo Hospital building, post-mortem room and the incinerator room cover an area of 210.13 sq. m. This building is in bad shape and has to be demolished and a new one constructed to also contain a quarantine facility. This will be dealt with in detail in Part 2 of the Master Plan.

3.50.1 Zoo Hospital facilities

The Zoo Hospital has the following facilities to meet the requirements of health care management of captive wild animals:

(a) Operation Theatre – The air-conditioned Operation Theatre serves the needs of surgical operation on most of the wild species. A majority of the surgical cases arises from infighting and has to be attended to immediately. Species such as Jaguar, Leopard, Lion, Tiger, Lion-tailed Macaque, Rhesus Macaque, deers and birds often require surgical correction of severe wounds arising from infighting. Routine surgeries include vasectomy, tumour removal, filleting and various orthopaedic operations. The facility is used also for surgical procedures to correct cataracts, endoscopic removal of foreign body, thoracic surgeries, tooth extraction, etc. In cases where the animals are large – such as Elephant and Hippopotamus – surgeries are conducted near their enclosures, using portable equipment.

The equipment available in the operation theatre include hydraulic operation table, shadowless lamp, suction pump, electrosurgical unit, multi-parameter monitor, oxygen concentrator, Boyles anaesthetic apparatus, non-contact infra-red thermometer, intramedullary pinning equipment and heavy-duty, lightweight stainless steel stretchers.

(b) Pharmacy – All essential veterinary medical supplies – which includes emergency supplements, antivenins, antibiotics, analgesics, antihistamines, anthelmintics, dressing materials, vaccines and nutritional supplements – are stocked in Zoo Hospital Pharmacy. Electronic weighing balance and analytical balance are available for dosing medicines for compounding before administering to the sick animals.

(c) Sterilization Room – Heavy-duty autoclaves, hot air oven, pressure cooker, sterilizer, etc. are available in the Sterilization Room for disinfecting surgical equipment and tranquilizing equipment and accessories.

(d) Tranquilizing equipment – Chemical restraining is an important procedure for providing treatment, vaccination, and crating and shifting of wild animals kept in captivity. Remote drug delivery instruments are also used to administer medicines through injections without restraining the animal and causing stress to them. Only pneumatic syringes are employed for delivery of medicine to minimize impact injury. The Zoo Hospital has got the following tranquilizing equipment:

- Dan Inject JM model pneumatic gun and accessories fitted with barrel to suit 1 ml to 3 ml darts);
- Dan Inject JM model pneumatic gun and accessories fitted with barrel to suit 5 ml to 10 ml darts);
- Telinject pneumatic gun with carbon dioxide attachment (fitted with barrels to suit 1 ml to 10 ml darts) and accessories;
- Dist Inject blowpipe and accessories; and
- Dist Inject pole syringe and accessories.

(e) Laboratory – The laboratory has all basic facilities to conduct tests routinely. It is equipped with advanced microscopes having telepathology facility, laminar air flow, microtome, cyclomixer, PH meter, spectrophotometer, centrifuge, incubators, refrigerator, autoclave, hot air oven, distillation apparatus, constant temperature water bath, and equipment to test blood, urine and faeces of animals. The laboratory stocks latest lateral flow kits to easily and rapidly identify various diseases of animals and birds. There are tie-ups with higher laboratories close by for advanced laboratory procedures and tests.

(f) Radiology (X-Ray) facility – For radiology, the Zoo Hospital has a GE Genius100 mobile X-ray unit, under annual maintenance contract to keep it functional always.

(g) Diagnostic ultrasound scanning facility – A Mindray Z6 vet Ultrasound portable system was purchased for soft tissue scanning. This system is portable like a laptop computer and is easy to use.

(h) In-patient treatment wards – The Zoo Hospital has in-patient facility to house animals/birds individually and to provide necessary treatment under close observation and monitoring. The wards have squeeze cage facility to restrain animals.

(i) Quarantine – Rescued/gifted animals, as well as animals received on exchange basis, are kept under quarantine before their release to the enclosure. Routine health checks, and provision of necessary medicines and supplements are routinely carried out under quarantine.

(j) Documentation – All the information related to health care management of mammals, birds and reptiles are rerecorded in the Central Zoo Authority (CZA) format. New software is being developed to document all the activities of the Zoo Hospital. At present, two computers are available in the hospital.

(k) Artificial egg incubation and brooding – Most of the pheasants and duck eggs are artificially incubated for better hatchability and survivability. Presently there is one 60 egg capacity incubator.

(l) Post-mortem Examination Room – The Post-mortem Examination Room is located a little away from the Hospital and in-patient rooms, and is provided with examination platform and lighting and ventilation equipment.

(m) CCTV unit – All important hospital sections, as well as all enclosures, are monitored through cameras with night vision and recording facilities. The doctor's cabin has a display unit for undisturbed round-the-clock monitoring of animal behaviour during parturition and neonatal care of animals in dark room/den. All the important enclosures can be monitored from the doctor's cabin.

3.50.2 Zoo Hospital activities

The Zoo Hospital carries out the following functions:

- Routine observation for health, hygiene and breeding management;
- Prophylactic measures to control various diseases among ungulates, carnivores and birds;
- Regular monitoring of visitor-induced stress on zoo inmates;
- Periodic supplementation of mineral mixture, essential amino acids and vitamins to promote good health and to reduce stress on the animals;
- Treatment of sick and injured wild animals in captive situation;
- Chemical restraining of wild animals for treatment, crating and shifting purposes;
- Hand-rearing of rescued wild animals, rejected young ones and young ones separated from dam to avoid cannibalistic behaviour of the mother;
- Population control of prolific breeders like Spotted Deer, Sambar Deer, Hog Deer, Hippopotamus, etc. by applying suitable birth control measures;
- Zoo education programmes for youth, students and trainees. An internship programme is being conducted for final year B.V.Sc. students of the Colleges of Veterinary and Animal Sciences Mannuthy and Pookode, as well as for a few students from European countries;

- Interested B.V.Sc. graduates are employed on contract basis so as to provide them with firsthand experience in treating wild animals and furthering the profession of veterinary management of wild animals; and
- M.V.Sc interns from different universities are given opportunity to conduct their research work under the guidance of the Zoo vet. Some of the well known foreign universities such as University of Calgary and University of Edinburgh associate with the Veterinary Section on research activities. The Veterinary Section also conducts its own research.

4 Present Arrangements and Their Constraints

4.1 Animal Section

THE Zoo Superintendent is in charge of the Animal Section and is assisted by a Curator. Presently, the animals are housed in 35 enclosures and 50 cages. Many of them were constructed during the period from 2002 to 2005. Few enclosures have been added later, and some enclosures have been modified as directed by CZA. The animals housed in the Zoo are as follows (Table 1):

Table 1: Animals currently housed in the Zoo

Class	Species	Number
Mammals	27	424
Birds	57	190
Reptiles	20	75
Total	104	689

Each enclosure has been examined in detail and the present status of animals and enclosures has been recorded in the proforma. Any modification/change needed is noted in this chapter.

4.2 Veterinary Section

A hospital with modern facilities – such as X-ray instrument, in-patient ward, quarantine area, operation theatre, isolation ward and post-mortem room – is located inside the zoo. The diagnostic laboratory of the hospital has equipment and instruments like binocular microscope, hot air oven, horizontal laminar airflow, etc. Samples of blood, serum, faecal matter, urine and skin are tested regularly for animal disease diagnosis.

The quarantine area houses the new arrivals brought to the zoo for a specified period of time to monitor their health status by clinical examination and laboratory investigation and to rule out contagious diseases. These animals are given prophylactic and therapeutic treatment before exhibiting them. The animal is held in a separate facility and cared for by keepers who are not in charge of looking after other animals. The quarantine area needs to be completely segregated from the hospital and other areas with a separate entry/exit point. At present, the quarantine facility can handle large carnivores (lion, tiger and leopard), primates, small mammals and birds. The facility can be extended to house other species like herbivores, reptiles, aquatic birds and nocturnal animals.

The State Animal Husbandry Department provides technical and laboratory support to the Zoo as and when required. The Department’s Chief Disease Investigation Office (CDIO) with an ultra modern laboratory is located just 20 km from the Zoo. In case of specialized and complicated problems, services of the experts from the two veterinary colleges in the state, namely Pookot in Wayanad and Mannuthy in Thrissur, are made use of.

4.3 Stores and Feed Supply Section

Two staff members in this section are Store Clerk and Store Attendant. The Store Clerk is in charge of the stock of dry feed and he is supervised by the Zoo Superintendent and the Veterinary Officer. Food materials like meat, fish, fruits vegetables, milk and eggs are procured fresh and are supplied by government agencies on a daily basis. All the food stuff purchased from the open market is decontaminated before supplying to the inmates. Feed mixing is also done in the store premises. The zoo office and the store are located in the same complex.

The quantity of food articles and meat distributed from the Zoo store each day is as follows (Table 2):

Table 2: Daily distribution of food/feed in the Zoo

Sl. no.	Food/feed item	Quantity (kg)
1	Non-perishable food articles	105
2	Fodder, grass, etc.	2,350
3	Fruits and vegetables	110
4	Red meat, chicken, fish, milk & eggs	172
5	Cattle feed	135

A sum of ₹1.50 crore is spent each year for feeding the animals, which on an average works out to ₹32,000 per day.

Day-old chicken and adult birds for snakes and owls are bought from the state run Regional Poultry Farm at Kudappanakunnu or the Kerala Poultry Development Corporation. Cattle feed is procured from the Cattle Feed Plant of the Kerala Co-operative Milk Marketing Federation (Milma) factory at Pattanakad. Milk also is purchased from Milma, while fruits and vegetables are supplied by the state-run Horticulture Corporation. The Section has a mini truck for feed transportation.

4.4 Sanitation Section

The Sanitation Section is managed by the Animal Section. The Garden Section of the Department of Museums and Zoos is responsible for the maintenance of lawns, gardens and the general cleanliness of the Zoo. Garbage and other wastes generated are removed by a private agency on a daily basis. Cleaning of moats and cages are done by the respective keepers with the help of sanitation workers. Three permanent sanitation workers attend to the sanitation work outside the enclosures. As there is a strict restriction on carrying plastics and food materials into the Zoo, the amount of garbage generated by the public is negligible. This helps the sanitation workers in keeping the Zoo premises neat and clean.

4.5 Maintenance Section

Major maintenance works at the Zoo are done by the State's Public Works Department. However, to take care of incidental and emergency repairs, the Zoo employs a carpenter, a mason and a blacksmith in its Maintenance Section.

4.6 Security Section

As the Zoo is located inside the museum premises and access to it is only through the main entrance gate of the museum, round-the-clock security is available for the zoo. Apart from this, four security day-time guards are posted inside the Zoo. During the night, two security guards and two keepers hold a vigil over the Zoo premises. A Police Station is located just outside the eastern entrance of the museum complex. Besides this, the services of a Police Aid Post with 11 policemen are available inside the complex round the clock. The perimeter wall of the Zoo is more than 3 m high and topped with barbed wire. Installation of a surveillance camera system is progressing. With this system in place the Zoo management can monitor the movement of visitors, animal behaviour and other activities.

4.7 Water Supply Section

The Zoo requires large quantities of water for various needs. Potable water is provided by the Kerala Water Authority to the visitors, staff quarters, Zoo hospital and the animals. Water required for filling the wet moats, watering the plants and lawns, and cleaning the cages and cubicles are pumped in from the Zoo lake. The pump house is managed by a pump operator. It has been proposed to dig two wells inside the Zoo premises as alternative sources of water. Two overhead water tanks are also proposed to be built inside the Zoo premises to ensure uninterrupted water supply at all times.

4.8 Disposal of Solid and Liquid Waste

Solid waste materials generated in the Zoo are removed everyday by a private agency. Liquid waste is drained by an effective drainage system, which is connected to the public drainage system outside the premises. The wastewater from animal enclosure, water points, rest areas and Veterinary Hospital is drained into the sewerage system. Rain water is guided through channels and storm water drains into percolation pits and lake. The water used for cleaning the faecal matter and leftover food is drained off into the sewerage system. The water in the wet moats and the ponds within the enclosures are periodically drained off to the public drainage system to maintain hygienic conditions. A biogas plant may be installed to utilize liquid/semi-solid waste materials to provide fuel for the Zoo store. A vermicompost plant may be set up to use the biodegradable solid waste materials, and serve as a source of additional income to the Zoo.

4.9 Visitors' Amenities

The Zoo strives to provide all basic facilities to the visitors to make their visit a pleasant experience. The following facilities have been provided to the visitors:

- Rest areas having sheds, benches, lawns and gardens
- Drinking water facility at many points
- Benches under shade trees
- Walkways and hedges in front of enclosures
- Natural landscaped areas with lawns and gardens
- Well maintained toilets at several spots
- Waste bins at several places
- Children’s Play Area just outside the Zoo premises
- Walkway around the Zoo lake
- Eateries and snack bars
- Electric carts (two 7-seaters and two 14-seaters)

4.10 Visitor Protection

To ensure the safety of the Zoo visitors, live hedge barriers and steel barricades have been provided in front of all cages and animal enclosures. In most of the moated enclosures, the moat wall itself serves as a barrier between the animal and the visitor (in addition to the live hedges), preventing the visitors from coming too close to the animals. It would, however, be of advantage to install near key enclosures alarms that could be sounded by a visitor in case of human casualty or other emergencies.

4.11 Garden, Lawns and Landscaping

The original garden of the Thiruvananthapuram Zoological Garden was designed and laid out in 1890s by Mr. Ingleby, an English man who was trained at Kew Gardens, England. Today the garden is considered as one of the most well maintained gardens in Kerala and has won several awards in flower shows conducted in Thiruvananthapuram. The garden area also has a bandstand, where the army band used to entertain the public in the past.

The Garden Section has a proud collection of a number of endemic and exotic trees and plants, of which many are endangered. School and college students visit the garden area to study about these plants and trees. The Garden Section also has an area devoted to medicinal plants, and another area that grows plants and trees associated with “birth star” as per the Hindu almanac. It has a nursery and a shade house where seedlings and vegetatively propagated saplings are raised for sale to the public.

The road and pathways along animal enclosures and public utility facilities have been landscaped in such a way that they reflect natural of conditions. Various evergreen and deciduous trees and many different species of bamboo are found all over the zoo. The canopy provides shade and an environment ideal for the animals and the visitors. The dense canopy developed over the years has created unique micro-climate in the Zoo. The lawns and gardens inside the Zoo premises are managed by the Garden Section staff of the museum complex, wherein the Zoo is located.

The Garden Section has adequate staff who sweeps the area, trims branches of trees, carries out topiary work, and plants suitable trees and plants inside and around animal enclosures. The garden area also has a small children’s park. More than 5,000 people visit the garden area daily.

5 Collection Plan

THE Central Zoo Authority (CZA) suggests the following split-up of the percentage of animals to be housed in a large zoo: 30% of the animals will be those found in the local area, 30% from the region, 30% national and 10% exotic animal species. Animals shall be procured strictly adhering to the norms specified by CZA.

As the main objective of the Thiruvananthapuram Zoo is wild life conservation with regard to species that are endemic to and endangered in the Western Ghats – such as Nilgiri Tahr, Lion-tailed Macaque, Nilgiri Langur and Malabar Giant Squirrel – special emphasis will be given to those species for collection, conservation and breeding.

There is a shift in policy of animal collection in the Zoo from unlimited number of animals with limited facilities to limited animals with adequate facilities. This is aimed at providing a natural display of animals and birds, similar to their natural habitat.

To make the zoo more attractive, there are plans to import exotic species from various parts of the world. Animals that are not in the present collection and are housed in various rescue centres of the Forest Department will be shifted to the Zoo in consultation with the Department.

5.1 Present Stock of Animals

The Thiruvananthapuram Zoological Garden currently has a total of 697 animals, birds and reptiles. A continent-wise inventory of present stock of animals is given in Annex 2.

5.2 Required Species

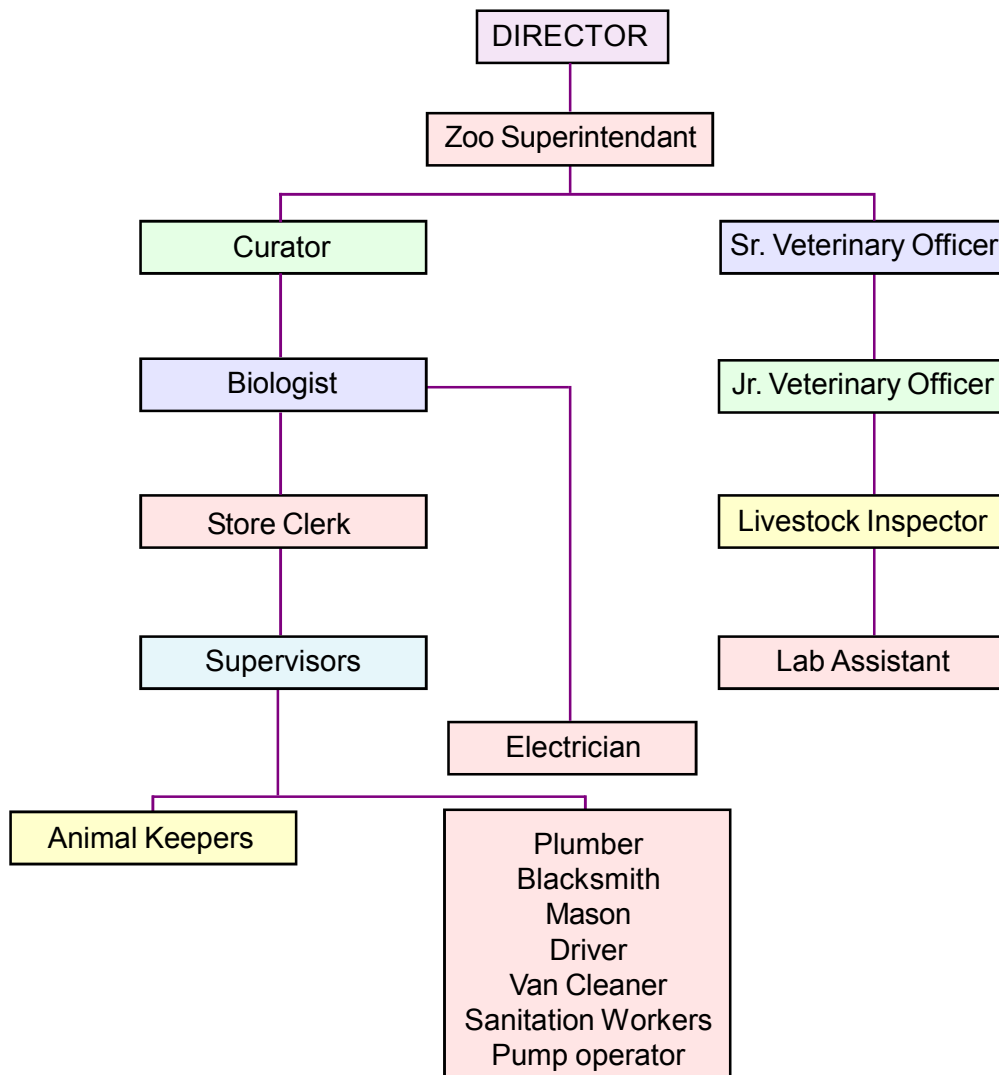
The Thiruvananthapuram Zoological Garden is planning to acquire several animals to add to its collection, including zebra, giraffe, wildebeest, Indian rhinoceros and puma.

6 General Administration of the Zoo

THE Thiruvananthapuram Zoo comes under the Department of Museums and Zoos of the Government of Kerala. The Director of Museums and Zoos is in charge of all the museums and zoos in the state. The Zoo Section of the Thiruvananthapuram zoo is mainly divided into two sections, namely the Animal Section and the Veterinary Section. The Superintendent is in charge of the routine activities and management of the Zoo while the Veterinary Officer takes care of the treatment aspects and nutrition of animals. The Curator is the field officer. The Director, Superintendent and Veterinary Officer reside within the campus.

The current organizational structure of the Thiruvananthapuram Zoological Garden is shown in Figure 1.

Figure 1: Organizational structure of the Thiruvananthapuram Zoological Garden



7 Research

WHILE structured research activity is not done directly by the Zoo staff, researchers from various universities and organizations do carry out research studies in the Zoo on the various aspects of animals and their behaviour. The Thiruvananthapuram Zoo offers a unique opportunity to scientists to study the behaviour and biology of wild animals and birds endemic to the Western Ghats at close range. This research is then disseminated to other zoos and universities, both in India and abroad.

Students from the two veterinary colleges in the state are required to attend one week in the Thiruvananthapuram Zoo as part of their internship programme.

8 Conservation and Breeding

THE Central Zoo Authority (CZA) has selected the Thiruvananthapuram Zoo as the conservation breeding centre for Lion-tailed Macaque, an Old World endangered monkey species endemic to the Western Ghats. The Thiruvananthapuram Zoo, in co-ordination with the zoos at Mysore and Chennai, launched a captive breeding programme for Lion tailed Macaque in 2003 and the programme is running successfully.

The Zoo is also breeding successfully various Indian species like Grey Heron, Leopard, Lion, Tiger, Jackal, Black Buck, Rhesus Macaque, Sloth Bear, Nilgai and Hog Deer, as well as exotic species like Cape Buffalo and Hippopotamus.

9 Education and Awareness

CREATING awareness among the public and educating them about the importance of wildlife protection and conservation are two of the fundamental purposes of a Zoo. With support from the Zoo, various non-governmental organizations like Zoo Watch conduct nature awareness camps and workshops inside the Zoo campus on a regular basis.

The Thiruvananthapuram Zoo has a well equipped, air-conditioned library with a collection of over 800 books on nature, animals and birds. The public can avail of its facilities for reference purposes during office hours.

Painting and essay competitions, film shows, quiz programmes, etc. are conducted in connection with the Wildlife Week celebrations. A brochure depicting the layout and details about the Thiruvananthapuram Zoo is provided to visitors on request.

Sign boards near animal enclosures provide all essential information about the behaviour, normal habitat, feeding habits and other details of the displayed species.

9.1 Animal Adoption Programme

The Thiruvananthapuram Zoological Garden has implemented an animal adoption programme with the help of various institutions and non-governmental organizations. The programme, the thrust of which is to create an opportunity for citizens to participate in wildlife care, is gradually becoming popular. The persons or organizations that take part in the adoption programme receive the following benefits:

- One year free complimentary pass for five family members;
- Official certificate of adoption;
- Wide publicity in local press and media; and
- Display of their name in front of the adopted animal's enclosure.

The rates for adoption of different animals are appended as Annex 3.

9.2 Ban on Use of Plastics

The Thiruvananthapuram Zoo is declared as a “plastics-free zone” by the Government of Kerala and the following measures are carried out to enforce the ban: (1) the visitors to the Zoo have to replace plastic bags with paper bags for which a nominal amount is charged; and (2) visitors who carry plastic water bottles have to either discard the bottles at the bin at the entrance or deposit ₹20 for carrying the bottle inside the Zoo. On paying the deposit, the staff at the entrance will paste a sticker onto the bottle. On production of the bottle with sticker at the exit, the deposit is returned to the visitor. The plastic bottles left at the exit are sold to the recycling units and the income from the sale is used for staff welfare measures.

10 Training for Zoo Staff

10.1 Animal Management

THE Zoo conducted a training programme for Animal Keepers in the state in 2007 with the financial assistance of the Central Zoo Authority (CZA). Another South Zone-level training programme for mahouts was organized in 2008 with the help of CZA. More such training programmes need to be conducted on a regular basis to keep the keepers abreast with the latest developments in animal management.

The keepers of the Thiruvananthapuram Zoo are taken to different zoos in India in order to familiarize them with the package of practices followed in those zoos, so that they will be able to acquire new knowledge and put it to practice in this Zoo.

10.2 Crisis Management

Escapes of animals, natural disasters and aberrant human behaviour can create unforeseen situations in a zoo. The Thiruvananthapuram Zoo has in place a meticulous crisis management plan to cover all foreseeable exigencies. The Zoo management has imparted adequate training to the staff to rise up to the situation and to face it. A more detailed treatment of this topic is provided in the section on Disaster Management in Part 2.

11 Inadequacies and Shortcomings

THE following inadequacies and shortcomings have been identified in the Thiruvananthapuram Zoo:

1. At present, Jaguar, Malabar Giant Squirrel, Porcupines, Civet Cats, Toddy Cats and Jungle Cats are kept in very small cages, which are old and dilapidated.
2. Many species of animals like Ostrich, Malabar Giant Squirrel and Zebra are either lone or of the same sex.
3. Over population is still a cause of major concern with most deer species, which are prolific breeders, despite the best efforts like sterilization and segregation, although the birth rates have come down.
4. The building in which the Zoo store and Zoo office function is very old and dilapidated. Feed mixing is done here and it does not conform to the desired levels of hygiene.
5. The Zoo does not have an incinerator.
6. Many posts of animal keepers are vacant.
7. Certain enclosures have walkways all around them which lead to stress to animals.
8. The Thiruvananthapuram Zoo has only one post of Veterinary Officer, which is inadequate to manage a zoo of this magnitude and variety.
9. There is no fence around the ungulate enclosures and many a time, animals are pushed into the moats by their pen mates, resulting in injuries.
10. The fencing around the open tiger enclosure is very old and there is an ever present danger of visitors falling inside.
11. The Thiruvananthapuram Zoo solely depends on the lake inside its premises for its water requirements for cleaning of animal enclosures and filling of wet moats and tanks inside the enclosures. There is no alternative to fall back on to in case of drought.

PART 2

1 Concept Plan

1	Name of the Zoo	Zoological gardens, Thiruvananthapuram	
2	Category of the Zoo	Large	
3	Area of the Zoo	36.03 acres or 145,821.50 sq.m.	
4	Objectives	<ol style="list-style-type: none"> 1. Conservation breeding of Lion-tailed Macaque, Nilgiri Langur, Malabar Giant Squirrel and Nilgiri Tahr, which are endangered and endemic to the Western Ghats. 2. Conservation education and awareness. 3. Research for conservation of wild animals in captivity. 4. Rescue and rehabilitation of Tiger/Lion/Leopard/Sloth Bear/Monkeys. 	
5	Theme of display	Broad taxonomic display of wild animal species of National importance with special emphasis on those of Western Ghats.	
6	Animal Collection Plan	<p>Lion-tailed Macaque, Nilgiri Langur, Malabar Giant Squirrel, Tiger, Leopard, Sloth Bear, Common Otter, Hyena, Jackal, Porcupine, Indian Gaur, Spotted Deer, Sambar Deer, Blackbuck, Nilgai, water birds, Peafowl, Hornbill, Red Jungle Fowl, Gharial, Crocodile, Terrapins, Tortoise, Snakes, etc.</p> <ol style="list-style-type: none"> 1. Off-display Conservation Breeding Centres for Lion-tailed Macaque and Nilgiri Langur. 2. Off-display Rescue Centres for Tiger/Lion/Leopard/Sloth Bear/Monkeys. 	
7	Master (Layout) Plan	Already approved by CZA, subject to review every five years to meet new challenges and requirements.	
8.	Manpower	<ol style="list-style-type: none"> 1. Director (IFS, Vet or PhD in WL) 2. Superintendent (MSc. Zoology, WL) 3. Curator (MSc. Zoology, WL) 4. Senior Veterinary Officer 5. Veterinary Officer 6. Biologist (MSc. Zoology, WL) 7. Education Officer (MSc. Zoology, WL) 8. Support staff 	<ol style="list-style-type: none"> 1 No. 1 No. 1 No. 1 No. 1 No. 1 No. 1 No. As per need

2 Future Vision and Mission Plan

THE primary objectives of a Zoological Garden are to undertake ex-situ conservation of species and to supplement the efforts for the in-situ conservation of species. The ex-situ conservation facility should have an animal collection and breeding plan and integrate the theme of Biological Park with the co-existence of plant and animal species. A zoo's conservation efforts should support not only the conservation of endangered species but also their natural habitat and ecosystem.

2.1 Mission Statement/Objectives

The National Zoo Policy, 1998, highlights a shift in the policy of animal collection and exhibition from unlimited animals with limited facilities to limited animals with adequate facilities. The shift is aimed at conservation, education and research, as opposed to mere recreation and entertainment. Keeping this in view, the objectives of the Thiruvananthapuram Zoological Garden have been reframed as follows:

- To conserve and breed animals, particularly endangered ones, that are endemic to the Western Ghats – especially the Lion-tailed Macaque, Nilgiri Langur, Nilgiri Tahr and Malabar Giant Squirrel – for the preservation of biodiversity, exchange of bred animals with other zoological parks, as well as their re-introduction to the wild, strictly adhering to prescribed norms.
- To facilitate the conduct of scientific studies and research in animal behaviour, reproductive biology, feeding and nutrition, and diseases and their control. Information so acquired will then be disseminated to other zoological parks in India and around the world.
- To provide facilities for nature education and awareness creation on the need for wildlife conservation among the public, with special attention to the younger generation.
- To develop the institution as a training centre for the management of wild animals and their upkeep, offering veterinarians and scientists the opportunity to take advantage of the experience that the institution has gathered in the captive management of wildlife.

2.2 Display of Animals

Zoos display their animals in a variety of ways. The most common manner is arranging the animals as per the taxonomic classification. This is the most traditional manner, as animals are assembled in separate blocks of reptiles, birds, carnivores, herbivores, etc. However, this assemblage does not reflect the natural occurrence of animals in the wild where animals from various taxa occupy the same niche in the wilderness.

Some zoos have placed the animals according to their geographical distribution and place of origin. The geographic theme display will have animals from different regions of the country: for example, North East animals, Western area animals, Central peninsular animals, and animals from Africa, South America, Australia, etc.

Another way of exhibiting animals is based on their habitat. Animals of similar habitats are assembled together such as aquatic, burrowing animals, desert animals, Western Ghats animals, and so on. Some exhibits are designed based on the behavioural pattern of animals: for instance, nocturnal house, serpentarium, etc.

The Thiruvananthapuram Zoo will follow region-wise, theme-based display of exhibits.

2.3 Future Action Plan

Certain species of animals such as the Nilgiri Tahr and the Malabar Pit Viper are endemic to the southern part of India, but are not featured in the zoological park's existing collection of animals. Steps should be taken for the procurement of these animals, especially because their numbers are dwindling in the wild. The collection plan for other endemic and endangered animals to this part of the country will remain the same. Most of these animals are not featured in the collection of most zoos in India. These animals can also be exchanged with other zoological parks, which have congenial environment for their survival, for species not featured in our collection.

2.4 Animal Collection Plan

The Thiruvananthapuram Zoo has already formulated an animal collection plan, which covers nine species of mammals and four species of birds (Table 3). While this plan includes exotic ones, emphasis will be given to local and regional animals of the Indian sub-continent. With its large naturalistic enclosures and theme-based designs, the Thiruvananthapuram Zoological Garden has many features of a modern zoo with a 21st century vision. This would be maintained, and efforts will be made to make the Zoo more modern. A list of existing stock of the 697 animals, birds and reptiles is given in Annex 2.

Table 3: Species identified under the collection plan

Sl. no.	Name of the species	Present stock with the Zoo				Proposed collection				Animals to be acquired				Remarks
		M	F	U	T	M	F	U	T	M	F	U	T	
1	Mammals (regional) Himalayan black bear (<i>Ursus thibetanus</i>)	0	1	0	1	2	3	0	5	2	2	0	4	
2	Sloth bear (<i>Melursus ursinus</i>)	1	1	0	2	2	3	0	5	1	2	0	3	
3	Jaguar (<i>Panthera onca</i>)	0	1	0	1	2	3	0	5	2	2	0	4	
4	Indian one-horned rhinoceros (<i>Rhinoceros unicornis</i>)	1	0	0	1	2	3	0	5	1	3	0	4	
5	Asiatic lion (<i>Panthera leo</i>)	0	0	0	0	2	3	0	5	2	3	0	5	

Notes: M = Male; F = Female; U = Undetermined; T = Total.

Table 3: Species identified under the collection plan (contd.)

Sl. no.	Name of the species	Present stock with the Zoo				Proposed collection				Animals to be acquired				Remarks
		M	F	U	T	M	F	U	T	M	F	U	T	
	Mammals (exotic)													
6	Giraffe	0	0	0	0	2	3	0	5	2	3	0	5	Existing one is very old
7	Zebra	0	1	0	1	2	3	0	5	2	3	0	5	
8	White tiger	0	1	0	1	2	3	0	5	2	2	0	4	
9	White lion	0	0	0	0	2	3	0	2	2	3	0	5	
	Birds													
1	Violet Turaco (<i>Musophaga violacea</i>)	0	0	0	0	2	3	0	5	2	3	0	5	
2	Hartlaub's Turaco (<i>Tauraco hartlaubi</i>)	1	1	0	2	2	3	0	4	1	2	0	3	
3	Livingston Turaco (<i>Tauraco livingstonii</i>)	2	1	0	3	2	3	0	5	0	2	0	2	
4	Cassowary (<i>Casuarius</i>)	0	0	0	0	2	3	0	5	2	3	0	5	

Notes: M = Male; F = Female; U = Undetermined; T = Total.

3 Master Layout Plan

A zone-based layout plan was designed with the assistance of the Central Zoo Authority (CZA). This Master Layout Plan approved by CZA is given in Annex 4.

While executing the works in the Layout Plan, certain modifications have to be carried out. Hence, there is a need for preparing a fresh layout plan after the completion of enclosures construction. While there will not be any difference in the locations of the enclosures as shown in the layout plan, there will be some changes in their dimensions owing to space restraints. Even though the Master Layout Plan was approved by CZA in January 2013, the construction of new enclosures were started only towards the end of 2014. The construction of new enclosures for Nilgai, Barking Deer, Hyena, Jackal and Malabar Giant Squirrel will be completed in the first phase and, if necessary, the Master Layout Plan will be modified later.

4 Proposals to Address Inadequacies Identified in the Appraisal Report

THE animal houses and open paddock areas of all primate species shall be provided with activity-stimulating equipment and toys like ropes, lofts, poles and hammocks. Fruit-bearing trees will be planted in these enclosures so that they become a food source and will also help in providing critical natural proteins to the animals, as they will feed on various insects and flies that are attracted to the ripe fruits.

Trees will be planted in the Giraffe enclosure. As the Giraffe might feed on the growing saplings, the open area may be separated into two and trees planted in one of the areas. The animal will be let into this area only after the trees have grown sufficiently.

Sambar and Spotted Deer enclosures will be provided with completely covered shelter areas, into which sick and injured animals can be moved to shield them from nuisances such as crows. Parts of the moats will be covered with rubble so that these animals are not pushed into the moats by their pen mates.

At present, Jaguar, Malabar Giant Squirrel, Porcupines and small cats (Civet Cat, Toddy Cat and Jungle Cat) are kept in very small cages that are old and dilapidated. Steps will be taken so that larger individual enclosures are provided for these species.

In the current stock, many species of animals like Ostrich and Zebra are lone or of the same sex. Priority would be given to find suitable mates for such animals.

Facilities for breeding mice, insects and lizards will be set up to meet the feeding needs of various species of birds of prey and reptiles.

Most deer species are prolific breeders and despite our best efforts like sterilization and segregation, over population is a cause of major concern in the zoo, although the birth rates have come down following steps such as the segregation of males and females. Adequate measures will be taken to identify a satellite area and shift the excess population there.

Most modern tranquilization equipment and post-mortem kit shall be purchased for the Zoo Hospital. An incinerator for disposing off carcasses and biological waste will be purchased at the earliest. Mobile squeeze cages of different sizes will also be procured. An ultra sound scanner with colour Doppler will be purchased for aiding diagnosis of diseases and pregnancy in many animals. Recommendations for modernization of the zoo hospital are appended as Annex 5.

The government will be apprised of the necessity of a second veterinary officer in the zoo. The government will also be informed of the need to increase the number of security guards and animal keepers in the Zoo. One-fourth of the Animal Keeper posts are currently vacant. Urgent steps will be taken to fill up these and other existing vacancies.

The slope of the moat on the inner side of ungulates enclosures will be designed and constructed in such a way that even if an animal falls in, it will not get injured.

The existing zoo office and store will be demolished and a new office complex built with space for store, zoo office, feed mixing plant, kitchen, dry feed storage area, cold storage, meat preparation and inspection area, rest rooms for staff, and guest rooms.

To improve the ground water sources, rain water harvesting is imperative. Percolation ponds will be developed at various locations in the premises to conserve rain water and thus help in increase the ground water level. Drains will be constructed to divert rainwater into the Zoo lake.

Two wells are proposed to be dug inside the Zoo premises. An overhead water tank will also be built so that water can be stored for guaranteed supply.

5 Animal Healthcare

5.1 Animal Mortality and Remedial Measures

Like all other zoos, the Thiruvananthapura Zoo too has its share of animal mortality. The main reasons for animal mortality are: (a) old age; (b) diseases; (c) infighting; and (d) predator attack.

Old age: All animals showing symptoms of senility and are no longer capable of maintaining status in a herd are separated from the herd, and palliative care, as required, is provided.

Diseases: The Zoo Hospital is well equipped to handle all kinds of emergencies and routine treatments. Facilities include ultrasound, radiography, darting equipment, and all medications required along with surgical equipment. In spite of regular monitoring and prophylactic measures (including providing vaccinations and feed supplements) for disease prevention, the zoo inmates do contract various illnesses, such as pneumonia, septicaemia and enteritis. As soon as the onset of an illness is noticed, the ill animal is examined by the Veterinary Doctor and the measures as required, including isolation and hospitalization, are adopted. At times, despite the best efforts on the part of the veterinary staff, the animal succumb to the ravages of the disease. In such an eventuality, extra care is taken at the disposal of the carcass to prevent spread of communicable diseases.

A study conducted by the Veterinary College, Puducherry, India revealed that the main cause of mortality among the Zoo animals were pneumonitis and that too in Deers. The incidence was seen mainly during the rainy season. The study concluded that the lack of proper shelters for ungulates could be the reason for this. Therefore more shelters were made in Spotted Deer, Hog Deer, Sambar Deer and Black Buck enclosures. This measure could drastically reduce the incidence of pneumonitis in these animals.

Stepping up of laboratory services like installation of high-end telepathology microscope and latest lateral flow kits has enabled easy and fast diagnosis of diseases, resulting in curtailing disease outbreaks. Regular vaccinations for various diseases, especially foot and mouth (FMD) and setting up disinfectant foot bath in front of every enclosures and gates have curtailed the entry of contagious diseases like FMD. Only this Zoo remained unaffected during the recent massive national wide FMD outbreak.

Infighting: The main reasons for infighting are lack of space and skewed sex ratio. New enclosures with larger areas are being constructed to adequately meet space requirements. All adult Spotted Deer were vasectomised as part of a project for standardisation of anaesthetic protocols, in collaboration with the College of Veterinary and Animal Sciences, Pookode, Kerala, India, and University of Calgary, Canada. Similar measures are being taken to control the population of Sambar deer housed at the Zoo. The Zoo also resorts to exchange of animals with other zoos in order to correct the skewed sex ratio.

Predator: This issue is most significant in the case of birds. Repair of dilapidated bird enclosures to prevent entry of mongooses, the most common predator, is urgently required using wire mesh or “flexiglass”.

Annex 6 shows data on animal mortality for the past five years.

6 Education and Awareness

6.1 Sign Boards

Sign Boards at the animal enclosures provide ample information on various aspects of the natural history of the inmates. The information provided include common name(s), scientific name, habitat, distribution, food habits, average weight, life span and conservation status. Besides such sign boards at enclosures, the Zoo also features boards that provide interesting information on animals. The Zoo campus also displays the common names and scientific name of a large variety of trees on the campus.

6.2 Interpretation Centre

Adequate space has been earmarked in the approved Master Layout plan for the construction of a state-of-the-art Interpretation Centre in the Zoological Garden, Thiruvananthapuram. The construction of the Centre will be in such a way that every visitor, before his entry proper into the animal display, will have to walk through this Centre. The visitors will be required to see a short movie on wildlife in the 3D theatre attached with the Interpretation Centre, which will also be equipped with a state-of-the-art touch-screen audio-video system that will be equipped to provide information on aquatic, avian and terrestrial fauna. This interpretation will open up a new world of curiosity and interest in the visitors. It will also sensitise the visitors regarding the value and need for conservation of wildlife and the importance of its conservation. Apart from this, the visitors will also be given lessons on the do's and don'ts inside the campus.

A similar Interpretation Centre is planned also for the Primates Section, wherein the visitors would be able to access educational and interesting information on primates using a state-of-the-art audio-video system.

7 Personnel Planning

EARLIER, the workers engaged in the zoo did not come into the job with any specific skill, knowledge or education. They acquired work experience over years in carrying out specific tasks for the management of the zoo and their service was regularized in due course. Where required, the workers were given in-house training to impart adequate skill and knowledge for the performance of their tasks. The workers in the zoo are expected to be competent in one or more the following disciplines, as required by their job profiles:

- Animal care and management
- Animal healthcare and nutrition
- Zoo sanitation
- Animal healthcare
- Animal transportation
- Zoo landscaping and horticulture
- Zoo education and interpretation
- Visitor hospitality and management
- Zoo research and monitoring
- Security

The staff strength for the zoo is fixed by the state government. Accordingly the following staff pattern has been provided (Table 4):

Table 4: Present staff pattern

Sl. no.	Designation	Number	Classification	Responsibility & Qualification
1	Director	1	Class 1	Officer in charge of all museums and zoos in Kerala State. He/she will be an IFS officer/Veterinarian/PhD holder in Zoology or Wildlife.
2	Superintendent	1	Class 2A	Official in charge of the Zoo. He/she will be an MSc degree holder in Zoology or Wildlife.
3	Curator	1	Class 2B	Officer who assists the Superintendent in the daily functions of the zoo as the field manager. He/she will be an MSc degree holder in Zoology or Wildlife.
4	Supervisor	2	Class 4	Supervises the work assigned to the Animal Keepers.
5	Animal Keepers	31	Class 4	Responsible for the upkeep of animals. (At present 15 posts are not filled)
6	Sanitation Workers	3	Class 4	

Table 4: Present staff pattern (contd.)

Sl. no.	Designation	Number	Classification	Responsibility & Qualification
7	Carpenter	1	Class 4	(The post is currently not filled) An MSc degree holder in Zoology or Wildlife. (The post is not filled at present)
8	Mason	1	Class 4	
9	Blacksmith	1	Class 4	
10	Driver	1	Class 3	
11	Van cleaner	1	Class 4	
12	Peon	1	Class 4	
13	Education officer	1	Class 2A	
14	Veterinary officer	1	Class 2A	
15	Livestock Inspector	1	Class 3	
16	Laboratory Assistant	1	Class 3	

Keeping in mind the development of the Zoo for the next 20 years, more posts need to be created. Even in the present scenario, the Zoo is facing an acute shortage of permanent staff and consequently, people are appointed on temporary basis to look after the routine work. This issue needs to be viewed very seriously and remedial measures taken immediately. The government will be informed of the matter. Suggested staffing of Thiruvananthapuram Zoo is shown in Annex 7.

7.1 Capacity Building

Updating of knowledge and skills of the Zoo staff is a continuous capacity building process. The staff must get opportunity to learn new methods and techniques in animal management. The Central Zoo Authority (CZA) provides funds for training programmes for the staff of the Zoo. Similar, regular in-house training needs to be organized in the Zoo. Education and skill development module for each staff category should be designed based on an assessment of their training needs, and suitable organization/agency should be identified for updating such skills and knowledge.

The educational exchange programme between zoos needs to be encouraged to give the staff exposure to new techniques and management methods in vogue in various zoos in the country.

CZA conducts training for higher level officers, and attending such programmes will be made mandatory for all concerned officers.

Periodic assessments and reassignments based on such assessments are a part of human resources management. As the staff gets older, they may not be in a position to carry out their earlier assigned functions effectively. The staff needs to be also protected from exposure to risks in the course of their duty. Therefore, they are to be assessed and evaluated regularly and jobs based on their mental and physical capacities assigned to them to ensure optimum efficiency in work.

8 Disaster Management

FOR a zoo of such size and reputation, a contingency plan to deal with disasters (both natural and human-made ones) needs to be formulated for the Thiruvananthapuram Zoo to enable it to handle any contingency at short notice. The Zoo has an animal population of more than 600 and some of these animals, if they escape from their cages, are capable of posing serious danger to the thousands of visitors that throng the Zoo each day. Besides escaped zoo animals, natural disasters and aberrant human behaviour too can create unforeseen situations. Meticulous prior planning with adequate financial support is needed for preparedness to face such exigencies in the interest of zoo animals and the visiting public. Invariably, such contingency plans come into action mostly as an aftermath of an emergency. Nevertheless, preparedness will allow successful control and mitigation at the shortest possible time.

During the year 2008, there was a Foot and Mouth Disease outbreak and the Zoo had to suffer significant losses, with two animal species – Mithun (*Bos frontalis*) and Wild Boar – getting wiped out. This event has reinforced the need to be prepared against such unforeseen situations.

8.1 Cyclones, Floods and Drought

As Thiruvananthapuram is not situated in a cyclone-prone region, floods, cyclones or droughts do not pose any major threat. The sloping terrain of the Thiruvananthapuram Zoo does not facilitate water logging even in the worst of monsoon season.

8.2 Fire

At present, in case of a fire the zoo has to depend solely on the Kerala Fire and Rescue Department. It is proposed to install a pipeline around the zoo with heads in front of the enclosures so that in case of an emergency they can be used to douse the flames until help arrives. The fire services headquarters is located about 2 km from the Zoo.

8.3 Civil Disturbances

There is a police aid post inside the museum campus manned by 11 officers round the clock. A Police station is located at about 200 m from the zoo premises. Hence any law and order problem arising out of a civil disturbance could be managed easily.

In the case of a work strike that causes disruption in feed supply, feed material can be purchased at short notice from the local market, which is located just about 1 km from the zoo. At present, most of the food materials are supplied by government agencies and hence a disruption in the supply is not foreseen. Deep freezers have been proposed to be installed in the zoo store so that perishable food material can be stored to ward off a feed supply threat.

8.4 Bomb Threat

Generally, in a bomb threat emergency, the Zoo staff would follow the same evacuation procedure as for a fire, except that all radio communications in the area would cease immediately to prevent visitors from overhearing conversation concerning the bomb threat, which could lead to panic and stampede. Bomb threats would be immediately referred to the Police authorities. The Bomb Disposal Squad of the Police Department is located just 2 km away from the Thiruvananthapuram Zoo.

8.5 Equipment to Tackle Emergency Situations

Table 5 lists the equipment required to handle emergency situations and their current availability in the Zoo. The equipment that are not available need to be procured urgently.

Table 5: Equipment required for dealing with emergency situations

Items required	Essential	Availability
Rubber boots	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Alarm systems	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Public address system	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Radio communications (walkie-talkie)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Protective gloves	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Helmet	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Measuring tape	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Shovels	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Pick axe	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Tranquilizing gun with drugs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Welding machine with sufficient welding rods	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ropes and nets	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cages	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Construction and repair materials like Cement, iron rods, sand etc	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Gas cutters	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Earth moving equipment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fire proof dress	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Goggles	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

9 Contingency Plans

9.1 Animal Escape

For managing issues arising from animal escapes, a special team has been constituted under the leadership of the Zoo Superintendent. The team includes a Veterinary Officer and three trained and experienced Animal Keepers. The team is equipped with the latest tranquilizing devices and restraint equipment. Another team consisting of the Zoo Curator, security staff and police officers has been formed to carry out the emergency evacuation as per the approved procedures.

Mock exercises are carried out at regular intervals so that the teams will be prepared to handle contingencies at short notice.

Necessary equipment like diesel generator, portable electric saws, axes, shovels, bill hooks, water tankers, diesel pumping sets, ropes, spot lights, emergency lamps, siren, loudspeakers/megaphones, chains, nuts and bolts, batteries and saw blades will be procured immediately. These equipment will be inspected periodically to ensure that they function properly.

9.2 Rescued Animals

Animals rescued from the wild are brought to the Zoo by forest officials and, sometimes, the public. Sufficient quarantine facilities are available for these animals. Such animals are later shifted to empty enclosures or released in the wild, depending on the animal and its condition.

9.3 Monkey Menace and Stray Dogs

Monkey menace is not a problem at the Thiruvananthapuram Zoo because there are no free-ranging monkeys in the city. The Zoo campus is under 24 hour security cover, and the main gates are guarded by security personnel. Because of this, and because the Zoo entrance and exit are inside the campus, the chances of a stray dog entering the Zoo premises is practically nil. A dog catching squad is functioning under the Thiruvananthapuram City Corporation whose services will be availed in case of a stray dog entering the Zoo. Three Animal Keepers will be trained in handling such a situation and provided with the necessary equipment.

9.4 Snake Bites

To manage emergencies like snake bites, 15 to 20 vials of polyvalent antivenin are kept at the Zoo Hospital at all times. Besides, there are many reputed hospitals nearby that are in a position to manage such medical emergencies.

9.5 Injuries

The nearest government hospital is only about 1.5 km away from the Zoo. In case of injury to visitors or staff members, they could be moved immediately to this hospital.

9.6 Animal Infighting

Every enclosure is provided with an isolation area. In case of infighting among animals, they can be segregated into this area. A team consisting of the Superintendent, Veterinary Officer and three trained Animal Keepers, who are equipped with tranquilizing and restraint equipment, is ready at all times to meet emergencies that might arise from such infighting.

9.7 Disease Outbreaks

Vaccinations are provided to animals wherever possible to keep them immune to diseases outbreak. However, unforeseen situations might develop. During the Foot and Mouth Disease (FMD) outbreak in 2008, the Thiruvananthapuram Zoo suffered significant losses and had to be closed down for two months till the threat passed. Ever since this incident, the entry of vehicles into the Zoo has been restricted.

Whenever an epidemic is reported in the district sufficient preventive measures are taken in the Zoo. Disinfecting tyre dips are enforced at the campus entrance, and all visitors to the Zoo premises are required to go through a disinfecting foot dip to help reduce the risk of contamination. The feline family are provided with regular Felovax/Rabigen vaccinations against Feline Pan Leucopenia and associated diseases. The dog family animals are inoculated with Canigen and anti-rabies injection regularly. The State Animal Husbandry Department extends full technical and physical help to deal with all disease-related emergencies.

9.8 Electricity Failure

At present, except for the pump house, electricity connection is not provided anywhere in the Zoo premises. As all enclosures are provided with both Kerala Water Authority and the pump house water lines, water will be available at all times regardless of power supply. A diesel generator is proposed to be installed in the Zoo premises to help in emergencies, and a separate portable generator needs to be provided in the Zoo Hospital for managing emergencies. Electricity connection will be made available to all animal houses and service roads through an underground cable system.

10 E-governance

THE Thiruvananthapuram Zoological Garden has made significant progress in the field of e-governance by the application of information technology in the transfer of data, maintenance of records, digitization of library, etc. A Web-based application has been developed to manage the Zoo management activities and proper record keeping. The newly developed zoo management system will cover the inmate records management, diet and food stock management and medical records management. This system will be in use from 2015 onwards.

An E-ticketing facility has also been developed and is already in place. A new website of Thiruvananthapuram Zoological Garden is getting readied with the help of KELTRON and will be launched in 2015.

As a part of digital zoo management, all sections including veterinary section and hospital have been digitally connected, and daily reports digitally generated by the keepers are electronically transferred to concerned officials. All the key Zoo officials are linked through the Internet.

The Government of Kerala has taken steps to bring in e-governance and paper less office, and the Zoological Garden will also follow this government initiative.

11 New Construction and Developments

11.1 Modifications and Constructions to be Carried Out in the Zoo

11.1.1 King Cobra enclosure

An enclosure for King Cobra will be constructed adjacent to reptile house, i.e. in between the reptile house and the crocodile house. It will have all modern facilities including air-conditioning.

11.1.2 Malabar Grey Hornbill enclosure

The old Capuchin enclosure will be suitably modified and rodent-proofed to house the Malabar Grey Hornbill. Nesting and hiding places, along with other enrichments, will be provided in this new enclosure.

11.1.3 Malabar Giant Squirrel

An area to house Malabar Giant Squirrel has been identified beyond the current Malabar Grey Hornbill enclosure.

11.1.4 Old primate enclosure

The existing structure will be modified as the Primate Interpretation Centre.

11.1.5 Old Chimpanzee enclosure and Cinerous Vulture enclosure

The existing buildings will be demolished and an aviary, with separations for the various owls, will be constructed.

11.1.6 Old aviary

This aviary will be demolished and a new aviary for storks and cranes will be set up in that area.

11.1.7 Aquatic aviary

The existing small lake of will be covered and a new aquatic aviary will be constructed to house the aquatic birds and storks.

11.1.8 Rhesus Macaque enclosure

An enclosure for Rhesus Macaque will be constructed near the existing Cape Buffalo enclosure.

11.1.9 Conservation Breeding Centre for Lion-tailed Macaque

The existing structure constructed for housing Chimpanzee will be modified and converted as a Conservation Breeding Centre for Lion-tailed Macaque.

11.1.10 Jaguar enclosure

Jaguar enclosure will be constructed near the current Zebra enclosure.

11.1.11 Hyena enclosure

The animal house in the Barking Deer enclosure is old and dilapidated. It has an area of 14.50 sq.m. and an open paddock area of 717.2 sq.m. The open paddock area will be extended backwards till the drainage line to acquire more space for the Hyena enclosure.

11.1.12 Jackal enclosure

An area of 925.27 located after the Hyena enclosure and the green belt is identified for constructing the new Jackal enclosure.

11.1.13 Blue Bull (Nilgai) enclosure

The enclosure covers an area of 1,211.64 sq.m. The open paddock area may be extended backwards up to the drainage line to acquire more space. The animal house with separate cubicles needs to be constructed at the backside.

11.1.14 Barking Deer enclosure

After the Blue Bull enclosure, there will be patch of green buffer area where of 99.165 sq. m. is demarcated for the construction of the Barking Deer enclosure.

11.1.15 Porcupine enclosure

The existing Porcupine enclosure is not designed scientifically. It would be therefore demolished and rebuilt as new enclosure that satisfies all the required parameters. An animal house, along with a restraining area, will be provided in this enclosure. A feeding trough/area with watering facility will also be provided.

11.1.16 Vermicompost plant

An area between the Zoo lake and the Rhinoceros enclosure has been identified for the construction of a vermicompost plant.

11.1.17 Burial ground

The burial ground encompasses an area of 190.51 sq.m. towards the western end of the Rhinoceros enclosure, near the Zoo boundary.

11.1.18 Post-mortem room

The existing old building is proposed to be demolished and a new post-mortem room spanning 150.39 sq.m. area constructed at the same location.

11.1.19 Butterfly Park

The present Mugger enclosure, which covers an area of 1,031.44 sq.m., will be demolished. The palm grove will be retained while all undergrowth removed. Various varieties of flowering plants will be propagated to attract butterflies of different species. This area will then serve as the open Butterfly Park of the Zoo. A pond will also be constructed in this area to hold tortoises and endemic fishes.

11.1.20 Zoo office-cum-store complex

The existing zoo office and store will be demolished and a new zoo store-cum-office complex built in the vacant space in front of the existing zoo store, facing the zoo. There will be four storeys in this building. The ground floor will be used for feed mixing room, kitchen, meat inspection and dressing room, storage area for various feed material, soaking pit for grams, weighing machines, cold storage and a room for storing articles like utensils, tools and other equipment. The first floor will house the offices of the Superintendent, Curator, Store Clerk and rest rooms. The second floor will have retiring rooms for Animal Keepers, Supervisors and other staff members, and a recreation room for them. The fourth floor will have two air-conditioned and two non-air-conditioned rooms, which will be used as guest rooms for visiting officials and dignitaries. This floor will also have a conference hall.

11.1.21 Staff quarters

Quarters for officers of the grade of Supervisors and Senior Animal Keepers will be constructed at the present location of the zoo store and zoo office.

12 Budget for Implementing the Master Plan

A rough cost estimate of the developmental programmes to be taken up in the Thiruvananthapuram Zoological Garden during the plan period is given below (Table 6):

Table 6: Rough cost estimate for the planned developmental programmes

Sl. no.	Project	Amount (in ₹)
1	Zoo office and store complex	3,10,00,000
2	Terrestrial Aviary	3,00,00,000
3	Aquatic Aviary	1,25,00,000
4	Electricity connection to all animal houses and service road via underground cable	2,00,00,000
5	Fire safety equipment installation	1,00,00,000
6	Modern hospital equipment (such as anaesthesia machine and ventilator)	15,00,000
7	New enclosures for	
	a. Jackal	50,00,000
	b. Hyena	60,00,000
	c. Nilgai	20,00,000
	d. Barking Deer	20,00,000
	e. Jaguar	1,50,00,000
8	Interpretation Centre	1,50,00,000
9	Visitor amenities	1,50,00,000
10	Training of zoo staff	20,00,000
11	E-governance	10,00,000
12	Quarters for Zoo Superintendent, Veterinary Doctors, Curator and senior supporting staff	3,00,00,000
13	Vehicles	50,00,000
	Total	20,30,00,000

13 Day-to-Day Maintenance

The day-to-day maintenance expenditure of the Thiruvananthapuram Zoo is as follows:

Table 7: Maintenance expenditure per day

Sl. no.	Item	Expense (₹)
1	Cost of feed	50,000
2	Water and electricity charges	1,000
3	Wages	75,000
4	Cost of fuel	1,000
5	Miscellaneous expenses	10,000
	Total	1,37,000

14 Management Plan

THE activities that started in the financial year 2013-14 and extending to 2022-23 (10 years) are shown below (Tables 8-17):

Table 8: Projects to be taken up during the year 2013-14

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of Zoo store-cum-office complex	3,10,00,000	In three phases
2	Fire safety equipment installation	1,00,00,000	In two phases
3	Procurement of equipment for disaster management	10,00,000	Current financial year
4	Modern anaesthesia machine and ventilators and allied equipments	15,00,000	Current financial year
5	Communication devices for zoo staff	1,00,000	Current financial year
6	Development of visitor amenities	40,00,000	In five phases
7	Training to Zoo staff	5,00,000	-
8	Construction of burial ground	3,00,000	Current financial year
9	Construction of new enclosure for Malabar Giant Squirrel and Malabar Grey Hornbill	15,00,000	Current financial year
10	Construction of quarters for Zoo staff	3,00,00,000	In five phases
11	Purchase of new vehicles	50,00,000	In three phases

Table 9: Projects to be taken up during the year 2014-15

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of Zoo store-cum-office complex	-	Phase 2
2	Fire safety equipment installation	-	Phase 2
3	Development of visitor amenities	-	Phase 2
4	Construction of new Aviaries	2,25,00,000	In two phases
5	Construction of quarters for Zoo staff	-	Phase 2
6	Purchase of new vehicles	-	Phase 2
7	Training to Zoo staff	20,00,000	-
8	Construction of new enclosure for Jackal	50,00,000	Current financial year
9	Construction of new enclosure for Hyena	60,00,000	Current financial year

Table 9: Projects to be taken up during the year 2014-15 (contd.)

Sl. no.	Item of work	Approximate cost (₹)	Work completion
10	E-governance	10,00,000	Current financial year
11	Purchase of new vehicles	-	Phase 2

Table 10: Projects to be taken up during the year 2015-16

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of zoo store-cum-office complex	-	Phase 3
2	Development of visitor amenities	-	Phase 3
3	Construction of quarters for zoo staff	-	Phase 3
4	Purchase of new vehicles	-	Phase 3
5	Construction of new Aquatic Aviary	-	Phase 2
6	Training for Zoo staff	20,00,000	-
7	Construction of new enclosure for Blue Bull	20,00,000	Current financial year
8	Construction of enclosure for Barking Deer – Modification	20,00,000	Current financial year

Table 11: Projects to be taken up during the year 2016-17

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Development of visitor amenities	-	Phase 4
2	Construction of quarters for Zoo staff	-	Phase 4
3	Training to Zoo staff	20,00,000	-
4	Construction of Interpretation Centre	1,50,00,000	In two phases
5	Providing electric connection through underground cable	1,00,00,000	In two phases

Table 12: Projects to be taken up during the year 2017-18

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Development of visitor amenities	-	Phase 5
2	Construction of quarters for zoo staff	-	Phase 5
3	Training of Zoo staff	20,00,000	-
4	Construction of Interpretation Centre	-	Phase 2
5	Providing electric connection through underground cable	-	Phase 2

Table 13: Projects to be taken up during the year 2018-19

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of vermicompost plant	10,00,000	In two phases
2	Construction of Jaguar enclosure	1,50,00,000	In two phases
3	Training of Zoo staff	20,00,000	-

Table 14: Projects to be taken up during the year 2019-20

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of vermicompost plant	-	Phase 2
2	Construction of Jaguar enclosure	-	Phase 2
3	Training of Zoo staff	20,00,000	-

Table 15: Projects to be taken up during the year 2020-21

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of off-exhibit enclosure for Lion-tailed Macaques	30,00,000	In two phases
2	Training of Zoo staff	20,00,000	-

Table 16: Projects to be taken up during the year 2021-22

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Construction of off-exhibit enclosure for Lion-tailed Macaques	-	Phase 2
2	Training of Zoo staff	8,00,000	-

Table 17: Projects to be taken up during the year 2022-23

Sl. no.	Item of work	Approximate cost (₹)	Work completion
1	Purchase of modern equipment for Zoo Interpretation Centre	30,00,000	-
2	Purchase of new vehicles	50,00,000	-
3	Training of Zoo staff	8,00,000	-

15 Resources

THE works connected with the implementation of the Master Plan to modernize the Thiruvananthapuram Zoological Garden may be taken up during the 12th five year plan itself, involving a major expenditure of ₹5.02 crore. The Central Zoo Authority (CZA) has agreed to contribute 50% of the total amount and the remaining 50% should be provided by the state government. An amount of ₹80,00,000 is generated annually from the Zoo which is expected to go up to ₹1,25,00,000 in the coming years. This additional income generated will considerably ease the burden on the state exchequer.

The revenue generated by the Thiruvananthapuram Zoo for the years 2002 to 2012 is as follows (Table 18):

Table 18: Revenue from Thiruvananthapuram Zoo (2002-2012)

Financial year	2002-03	2003-04	2004-05	2005-06	2006-07
Revenue (₹)	53,97,952	56,72,475	56,09,874	58,50,816	75,76,325
Financial year	2007-08	2008-09	2009-10	2010-11	2011-12
Revenue (₹)	82,16,316	98,56,734	1,10,36,526	1,27,53,905	1,41,53,150

Revenue collection from various sources in percentage is as follows (Table 19):

Table 19: Revenue collection by source

Source	Percentage
Entrance fee collection	80.00
Camera fees	11.00
Vehicle parking fee	8.95
Lease	0.5

An institution like the Thiruvananthapuram Zoo that feature live exhibits and an annual visitor footfall close to 2,00,000 requires constant upkeep and maintenance, besides a commitment for regular upgrading or facilities and exhibits. Shortage of funds can easily and rapidly choke such an institution. To prevent such a situation, it is proposed that the revenue generated by the Zoo be ploughed back into the institution. Such a measure would be in line with international and national practices adopted in similar institutions and comply with the guidelines issued by the Ministry of Environment and Forests (MoEF), Government of India.

Annex 1

A list of trees and shrubs on the Thiruvananthapuram Zoological Garden campus (Bentham & Hooker System)

Sl. no.	Plant family	Scientific name of plant
1	Magnoliaceae	<i>Magnolia champaca</i>
2	Anonaceae	<i>Annona reticulata</i>
3		<i>Annona squamosa</i>
4		<i>Artabotrys hexapetalus</i>
5		<i>Cananga odorata</i>
6		<i>Monodora myristica</i>
7		<i>Polyalthia longifolia</i>
8		<i>Sageraea laurina</i>
9	Menispermaceae	<i>Tiliacora acuminata</i>
10		<i>Tinospora cordifolia</i>
11	Capparidaceae	<i>Capparis zeylanica</i>
12		<i>Crataeva religiosa</i>
13	Bixaceae	<i>Bixa orellana</i>
14		<i>Hydnocarpus pentandra</i>
15		<i>Flacourtia indica</i>
16		<i>Flacourtia jangomas</i>
17	Guttiferae	<i>Calophyllum inophyllum</i>
18		<i>Garcinia gummi-gutta</i>
19		<i>Garcinia mangostana</i>
20		<i>Mesua ferrea</i>
21		<i>Mesua thwaitesii</i>
22	Dipterocarpaceae	<i>Hopea parviflora</i>
23		<i>Vateria indica</i>
24	Malvaceae	<i>Hibiscus rosa-sinensis</i>
25		<i>Hibiscus tiliaceus</i>
26		<i>Malvaviscus arboreus</i>
27		<i>Thespesia populnea</i>
28	Bombacaceae	<i>Adansonia digitata</i>
29		<i>Pseudobombax grandiflorum</i>
30	Sterculiaceae	<i>Cola acuminata</i>
31		<i>Guazuma ulmifolia</i>
32		<i>Helicteres isora</i>
33		<i>Kleinhovia hospita</i>
34		<i>Pterospermum diversifolium</i>
35		<i>Pterospermum rubiginosum</i>
36		<i>Pterospermum suberifolium</i>
37		<i>Pterygota alata</i>
38		<i>Sterculia balanghas</i>
39		<i>Sterculia foetida</i>

Sl. no.	Plant family	Scientific name of plant
40		<i>Sterculia urens</i>
41	Tiliaceae	<i>Berrya cordifolia</i>
42		<i>Grewia palodensis</i>
43		<i>Grewia tilifolia</i>
44	Elaeocarpaceae	<i>Elaeocarpus serratus</i>
45		<i>Muntingia calabura</i>
46	Malpighiaceae	<i>Galphimia gracilis</i>
47		<i>Hiptage benghalensis</i>
48		<i>Malpighia coccigera</i>
49		<i>Malpighia glabra</i>
50	Rutaceae	<i>Aegle marmelos</i>
51		<i>Citrus maxima</i>
52		<i>Glycosmis pentaphylla</i>
53		<i>Melicope denhamii</i>
54		<i>Murraya Koenigii</i>
55		<i>Murraya paniculata</i>
56		<i>Pamburus missionis</i>
57		<i>Ravenia spectabilis</i>
58	Simarubeae	<i>Ailanthus triphysa</i>
59		<i>Quassia amara</i>
60	Ochnaceae	<i>Gomphia serrata</i>
61		<i>Ochna integerrima</i>
62		<i>Ochna obtusata</i>
63	Burseraceae	<i>Commiphora caudata</i>
65	Meliaceae	<i>Aglaia elaeagnoidea</i>
66		<i>Aphanamixis polystachya</i>
67		<i>Azadirachta indica</i>
68		<i>Chukrasia tabularis</i>
69		<i>Melia azedarach</i>
70		<i>Swietenia macrophylla</i>
71		<i>Swietenia mahagoni</i>
72		<i>Toona ciliata</i>
73		<i>Walsura trifolia</i>
74	Oxalidaceae	<i>Averrhoa bilimbi</i>
75		<i>Averrhoa carambola</i>
76	Aquifoliaceae	<i>Ilex cornuta</i>
77	Celastraceae	<i>Lophopetalum wightianum</i>
78	Vitaceae	<i>Cissus quadrangularis</i>
79		<i>Cissus repens</i>
80		<i>Leea indica</i>
81	Sapindaceae	<i>Dimocarpus longan</i>
82		<i>Filicium decipiens</i>
83		<i>Litchi chinensis</i>
84		<i>Nephelium lappaceum</i>

Sl. no.	Plant family	Scientific name of plant
85		<i>Sapindus trifoliatus</i>
86	Anacardiaceae	<i>Anacardium occidentale</i>
87		<i>Gluta travancorica</i>
88		<i>Holigarna arnottiana</i>
89		<i>Lannea coromandelica</i>
90		<i>Mangifera indica</i>
91		<i>Semecarpus anacardium</i>
92		<i>Spondias pinnata</i>
93	Mimosaceae	<i>Acacia auriculiformis</i>
94		<i>Adenantha pavonina</i>
95		<i>Albizia lebbek</i>
96		<i>Albizia saman</i>
97		<i>Calliandra haematocephala</i>
98		<i>Calliandra surinamensis</i>
99		<i>Leucaena leucocephala</i>
100		<i>Parkia biglandulosa</i>
101		<i>Pithecellobium dulce</i>
102	Caesalpiniaceae	<i>Azalia quanzensis</i>
103		<i>Amherstia nobilis</i>
104		<i>Bauhinia acuminata</i>
105		<i>Bauhinia purpurea</i>
106		<i>Bauhinia variegata</i>
107		<i>Brownea grandiceps</i>
108		<i>Caesalpinia coriaria</i>
109		<i>Caesalpinia pulcherrima</i>
110		<i>Caesalpinia sappan</i>
111		<i>Cassia fistula</i>
112		<i>Cassia roxburghii</i>
113		<i>Delonix regia</i>
114		<i>Humboldtia vahliana</i>
115		<i>Hymenaea verrucosa</i>
116		<i>Peltophorum pterocarpum</i>
117		<i>Saraca asoca</i>
118		<i>Senna siamea</i>
119		<i>Tamarindus indica</i>
120	Fabaceae	<i>Abrus precatorius</i>
121		<i>Butea monosperma</i>
122		<i>Castanospermum australae</i>
123		<i>Dalbergia lanceolaria</i>
124		<i>Dalbergia latifolia</i>
125		<i>Erythrina crista-galli</i>
126		<i>Erythrina variegata</i>
127		<i>Gliricidia sepium</i>
128		<i>Myroxylon balsamum</i>

Sl. no.	Plant family	Scientific name of plant
129		<i>Pongamia pinnata</i>
130		<i>Pterocarpus marsupium</i>
131		<i>Pterocarpus santalinus</i>
132	Rosaceae	<i>Rosa damascena</i>
133		<i>Rosa multiflora</i>
134	Crassulaceae	<i>Bryophyllum pinnatum</i>
135		<i>Kalanchoe blossfeldiana</i>
136	Rhizophoreae	<i>Carallia brachiata</i>
137	Combretaceae	<i>Combretum indicum</i>
138		<i>Getonia floribunda</i>
139		<i>Terminalia arjuna</i>
140		<i>Terminalia bellirica</i>
141		<i>Terminalia catappa</i>
142	Combretaceae	<i>Terminalia chebula</i>
143	Myrtaceae	<i>Callistemon citrinus</i>
144		<i>Eucalyptus globulus</i>
145		<i>Eugenia uniflora</i>
146		<i>Psidium cattleyanum</i>
147		<i>Psidium guajava</i>
148		<i>Syzygium aqueum</i>
149		<i>Syzygium carophyllatum</i>
150		<i>Syzygium cumini</i>
151		<i>Syzygium jambos</i>
152		<i>Syzygium malacense</i>
153		<i>Syzygium zeylanicum</i>
154	Lecythydaceae	<i>Barringtonia asiatica</i>
155		<i>Barringtonia racemosa</i>
156		<i>Careya arborea</i>
157		<i>Couroupita guianensis</i>
158	Lythraceae	<i>Lagerstroemia microcarpa</i>
159		<i>Lagerstroemia speciosa</i>
160		<i>Lagerstroemia thorelii</i>
161		<i>Lawsonia inermis</i>
162	Caricaceae	<i>Carica papaya</i>
163	Cactaceae	<i>Perskea aculeata</i>
164	Araliaceae	<i>Polyscias balfouriana</i>
165		<i>Schefflera actinophylla</i>
166	Alangiaceae	<i>Alangium salvifolium</i>
167	Rubiaceae	<i>Canthium coromandelicum</i>
168		<i>Chassalia curviflora</i>
169		<i>Euclina longiflora</i>
170		<i>Gardenia gummifera</i>
171		<i>Gardenia jasminoides</i>
172		<i>Hamelia patens</i>

Sl. no.	Plant family	Scientific name of plant
173		<i>Hymenodictyon orxiense</i>
174		<i>Ixora brachiata</i>
175		<i>Ixora coccinea</i>
176		<i>Ixora finlaysoniana</i>
177		<i>Mitragyna parvifolia</i>
178		<i>Morinda pubescens</i>
179		<i>Morinda umbellata</i>
180		<i>Mussaenda erythrophylla</i>
181		<i>Pentas lanceolata</i>
182		<i>Psydrax dicoccos</i>
183		<i>Rosenbergiodendron formosum</i>
184	Plumbaginaceae	<i>Plumbago zeylanica</i>
185	Myrsinaceae	<i>Ardisia elliptica</i>
186	Ebenaceae	<i>Diospyros buxifolia</i>
187		<i>Diospyros discolor</i>
188		<i>Diospyros ebenum</i>
189		<i>Diospyros malabarica</i>
190	Sapotaceae	<i>Chrysophyllum cainito</i>
191		<i>Madhuca nerifolia</i>
192		<i>Manilkara kauki</i>
193		<i>Manilkara zapota</i>
194		<i>Mimusops elengi</i>
195		<i>Pouteria campechiana</i>
196	Oleaceae	<i>Myxopyrum smilacifolium</i>
197		<i>Nyctanthes arbor-tristis</i>
198	Salvadoraceae	<i>Azima tetraacantha</i>
199	Apocynaceae	<i>Aganosma heynei</i>
200		<i>Allamanda blanchetii</i>
201		<i>Allamanda cathartica</i>
202		<i>Alstonia scholaris</i>
203		<i>Carissa carandas</i>
204		<i>Catharanthus roseus</i>
205		<i>Holarrhena pubescens</i>
206		<i>Kopsia fruticosa</i>
207		<i>Nerium oleander</i>
208		<i>Odontadenia macrantha</i>
209		<i>Pentalinon luteum</i>
210		<i>Plumeria obtusa</i>
211		<i>Plumeria rubra</i>
212		<i>Strophanthus gratus</i>
213		<i>Tabernaemontana divaricata</i>
214		<i>Thevetia peruviana</i>
215		<i>Vallaris solanacea</i>

Sl. no.	Plant family	Scientific name of plant
216		<i>Wrightia tinctoria</i>
217	Asclepiadaceae	<i>Calotropis gigantea</i>
218		<i>Cryptolepis dubia</i>
219		<i>Cryptostegia grandiflora</i>
220		<i>Pergularia daemia</i>
221	Loganiaceae	<i>Strychnos nux vomica</i>
222	Hydrangiaceae	<i>Hydrangea macrophylla</i>
223	Boraginaceae	<i>Ehretia microphylla</i>
224	Convolvulaceae	<i>Poranopsis paniculata</i>
225	Solanaceae	<i>Brunfelsia americana</i>
226		<i>Brunfelsia grandiflora</i>
227		<i>Datura metel</i>
228	Bignoniaceae	<i>Anemopaegma chamberlaynii</i>
229		<i>Crescentia cujete</i>
230		<i>Dolichandra unguis-cati</i>
231		<i>Fernandoa adenophylla</i>
232		<i>Jacaranda acutifolia</i>
233		<i>Jacaranda mimosifolia</i>
234		<i>Kigelia africana</i>
235		<i>Mansoa alliacea</i>
236		<i>Markhamia lutea</i>
237		<i>Millingtonia hortensis</i>
238		<i>Parmentiera cereifera</i>
239		<i>Spathodea campanulata</i>
240		<i>Tabebuia aurea</i>
241		<i>Tabebuia rosea</i>
242		<i>Tecoma capensis</i>
243		<i>Tecoma stans</i>
244	Acanthaceae	<i>Graptophyllum pictum</i>
245		<i>Justicia gendarussa</i>
246		<i>Thunbergia erecta</i>
247	Verbenaceae	<i>Citheroxylon spinosum</i>
248		<i>Clerodendrum indicum</i>
249		<i>Clerodendrum paniculatum</i>
250		<i>Clerodendrum thomsoniae</i>
251		<i>Duranta erecta</i>
252		<i>Gmelina arborea</i>
253		<i>Gmelina asiatica</i>
254		<i>Holmskioldea sangiunea</i>
255		<i>Tectona grandis</i>
256		<i>Vitex pinnata</i>
257	Nyctaginaceae	<i>Bougainvillea spectabilis</i>
258		<i>Pisonia grandis</i>

Sl. no.	Plant family	Scientific name of plant
259	Polygonaceae	<i>Coccoloba uvifera</i>
260	Aristolochiaceae	<i>Thottea siliquosa</i>
261	Myristicaceae	<i>Myristica fragrans</i>
262		<i>Myristica malabarica</i>
263	Lauraceae	<i>Cinnamomum malabatrum</i>
264		<i>Cinnamomum verum</i>
265		<i>Persea americana</i>
266		<i>Persea macrantha</i>
267	Elaeagnaceae	<i>Eleagnus conferta</i>
268	Loranthaceae	<i>Helicanthes elasticus</i>
269		<i>Taxillus cuneatus</i>
270	Santalaceae	<i>Santalum album</i>
271	Euphorbiaceae	<i>Acalypha fruticosa</i> Forsk.
272		<i>Acalypha wilkesiana</i>
273		<i>Baccaurea courtallensis</i>
274		<i>Baliospermum solanifolium</i>
275		<i>Bridelia retusa</i>
276		<i>Codiaeum variegatum</i>
277		<i>Drypetes confertiflora</i>
278		<i>Euphorbia mili</i>
279		<i>Euphorbia nivulia</i>
280		<i>Euphorbia tirucalli</i>
281		<i>Euphorbia trigona</i>
282		<i>Excoecaria cochinchinensis</i>
283		<i>Hevea brasiliensis</i>
284		<i>Hura crepitans</i>
285		<i>Jatropha curcas</i>
286		<i>Jatropha gossypifolia</i>
287		<i>Jatropha podagrica</i>
288		<i>Joannesia princeps</i>
289		<i>Macaranga indica</i>
290		<i>Phyllanthus acidus</i>
291		<i>Phyllanthus emblica</i>
292		<i>Phyllanthus myrtifolius</i>
293		<i>Putranjiva roxburghii</i>
294		<i>Ricinus communis</i>
295		<i>Sauropus androgynus</i>
296		<i>Trewia nudiflora</i>
297	Ulmaceae	<i>Holoptelea integrifolia</i>
298		<i>Trema orientalis</i>
299	Moraceae	<i>Antiaris toxicaria</i>
300		<i>Artocarpus altilis</i>
301		<i>Artocarpus heterophyllus</i>
302		<i>Artocarpus hirsutus</i>

Sl. no.	Plant family	Scientific name of plant
303		<i>Castilla elastica</i>
304		<i>Ficus auriculata</i>
305		<i>Ficus barteri</i>
306		<i>Ficus benghalensis L. var. benghalensis</i>
307		<i>Ficus benghalensis L. var. krishnae DC.</i>
308		<i>Ficus benamina</i>
309		<i>Ficus cyathistipula</i>
310		<i>Ficus drupacea</i>
311		<i>Ficus elastica</i>
312		<i>Ficus hispida</i>
313		<i>Ficus lyrata</i>
314		<i>Ficus pumila</i>
315		<i>Ficus racemosa</i>
316		<i>Ficus religiosa L</i>
317		<i>Ficus talbotii</i>
318		<i>Ficus tinctoria</i>
319		<i>Ficus tsjahela</i>
320		<i>Ficus virens</i>
321		<i>Morus alba</i>
322	Casuarinaceae	<i>Casuarina equisetifolia L.</i>
323	Pinaceae	<i>Pinus roxburghii</i>
324	Cupressaceae	<i>Platycladus orientalis</i>
325		<i>Taxodium huegelii</i>
326	Araucariaceae	<i>Agathis robusta</i>
327		<i>Araucaria columnaris</i>
328	Podocarpaceae	<i>Afrocarpus gracilior</i>
329		<i>Podocarpus macrophyllus</i>
330	Cycadaceae	<i>Cycas circinalis</i>
331		<i>Cycas revoluta</i>
332		<i>Zamia furfuracea</i>
333	Orchidaceae	<i>Acampe praemorsa (Roxb.)</i>
334		<i>Arachnis Maggie Oei</i>
335		<i>Spathoglottis plicata</i>
336	Musaceae	<i>Heliconia angusta</i>
337		<i>Heliconia rostrata</i>
338		<i>Ravenala madagascarensis</i>
339	Zingiberaceae	<i>Alpinia calcarata</i>
340		<i>Etilingera elatior</i>
341		<i>Zingiber zerumbet</i>
342	Cannaceae	<i>Canna indica</i>
343	Liliaceae	<i>Agave vivirapa</i>
344		<i>Aloe vera</i>
345		<i>Asparagus racemosus</i>

Sl. no.	Plant family	Scientific name of plant
346		<i>Cordyline fruticosa</i>
347		<i>Dracaena angustifolia</i>
348		<i>Dracaena braunii</i>
349		<i>Dracaena fragrans</i>
350		<i>Dracaena marginata</i>
351		<i>Dracaena reflexa</i>
352		<i>Dracaena surculosa</i>
353		<i>Sansevieria cylindrica</i>
354		<i>Sansevieria roxburghiana</i>
355		<i>Smilax wightii</i>
356	Palmae	<i>Aiphanes horrida</i>
357		<i>Attalea cohune</i>
358		<i>Borassus flabellifer</i>
359		<i>Caryota urens</i>
360		<i>Cocos nucifera</i>
361		<i>Corypha umbraculifera</i>
362		<i>Cyrtostachys renda</i>
363		<i>Dypsis lutescens</i>
364		<i>Elaeis guineensis</i>
365		<i>Licuala grandis</i>
366		<i>Livistona chinensis</i>
367		<i>Livistona rotundifolia</i>
368		<i>Phoenicophorium borsigianum</i>
369		<i>Phoenix sylvestris</i>
370		<i>Ptychosperma macarthurii</i>
371		<i>Raphis excelsa</i>
372		<i>Roystonea regia</i>
373		<i>Thrinax radiata</i>
374		<i>Wodyetia bifurcata</i>
375	Pandaneae	<i>Pandanus amaryllifolius</i>
376	Araceae	<i>Aglaonema commutatum</i>
377		<i>Anthurium andraeanum</i>
378		<i>Anthurium magnificum</i>
379		<i>Dieffenbachia seguine</i>
380		<i>Epipremnum pinnatum</i>
381		<i>Epipremnum aureum</i>
382		<i>Philodendron bipinnatifidum</i>
383		<i>Pothos scandens</i>
384		<i>Spathiphyllum wallisii</i>
385	Poaceae	<i>Bambusa bambos var. gigantea</i>
386		<i>Bambusa multiplex</i>
387		<i>Bambusa ventricosa</i>
388		<i>Bambusa vulgaris</i>
389		<i>Dendrocalamus giganteus</i>

Sl. no.	Plant family	Scientific name of plant
390		<i>Dendrocalamus membranaceus</i>
391		<i>Dendrocalamus strictus</i>
392		<i>Dinochloa scandens</i>
393		<i>Gigantochloa nigrociliata</i>
394		<i>Ochlandra travancorica</i>
395		<i>Thyrsostachys siamensis</i>

Annex 2
A continent-wise inventory of present stock of animals

Sl. no.	Species	Number
	Asia: Mammals	
1	Himalayan black bear (0:1)	1
2	Sloth bear (1:1)	2
3	Blackbuck (17:8)	25
4	Blue bull (0:1)	1
5	Jungle cat (2:1)	3
6	Barking deer (1:0)	3
7	Hog deer (8:18:4)	30
8	Sambar deer (38:99)	137
9	Spotted deer (44:76:20)	140
10	Indian elephant (1:0)	1
11	Indian gaur (2:3)	5
12	Indian one-horned rhinoceros (1:0)	1
13	Common langur (1:1)	2
14	Nilgiri langur (2:2)	4
15	Leopard, panther (3:4)	7
16	Lion, hybrid (1:4)	5
17	Lion-tailed macaque (6:6)	12
18	Rhesus macaque (2:7)	9
19	Otter (1:0)	1
20	Indian porcupine (2:1)	3
21	Malabar giant squirrel (3:2)	5
22	Bengal tiger (4:3)	7
23	Toddy cat (1:2:3)	6
	Asia: Birds	
1	Barn owl (0:0:5)	5
2	Brown fish owl (0:0:3)	3
3	Spot-bellied eagle owl (1:1)	2
4	Darter (1:1:1)	3
5	Carolina duck (1:3)	4
6	Crested duck (3:2)	5
7	Mandarin duck (0:1)	1
8	Golden pheasant (4:4)	8
9	Green ring-necked pheasant (0:1)	1
10	Kalij pheasant (0:1)	1
11	Lady Amherst's pheasant (2:3)	5

Sl. no.	Species	Number
12	Red ring-necked pheasant (1:1)	2
13	Silver pheasant (1:3)	4
14	Silver golden pheasant (2:2)	4
15	Grey heron (5:3:1)	9
16	Night heron (1:1)	2
17	Pond heron (0:0:1)	1
18	Purple heron (1:2)	3
19	White ibis (1:1)	2
20	Brahminy kite (5:5)	10
21	Pariah kite (4:4:2)	10
22	White-bellied sea eagle (0:0:1)	1
23	Lesser whistling teal (0:2)	2
24	Alexandrine parakeet (1:1)	2
25	Rose-ringed parakeet (1:3:12)	16
26	Peafowl (12:3)	15
27	Grey pelican (2:2:1)	5
28	Rosy pelican (0:1)	1
29	Spoonbill (1:1)	2
30	Adjutant stork (1:1)	2
31	Painted stork (1:1)	2
32	White stork (0:0:1)	1
33	Bengal vulture (0:0:1)	1
34	Cinereous vulture (1:0:0)	1
35	Himalayan vulture (1:0:0)	1
36	King vulture (1:1:0)	2
	Asia: Reptiles	
1	Gharial	6
2	Marsh crocodile	1
3	Common Indian bronzeback	4
4	Common krait	1
5	Green whip snake	3
6	Indian rock python	5
7	Indian cobra	11
8	King cobra	2
9	Sand boa	4
10	Trinket snake	6
11	Rat snake	4
12	Russell's viper	4
13	Smooth water snake	3
14	Water snake (checkered keelback)	1

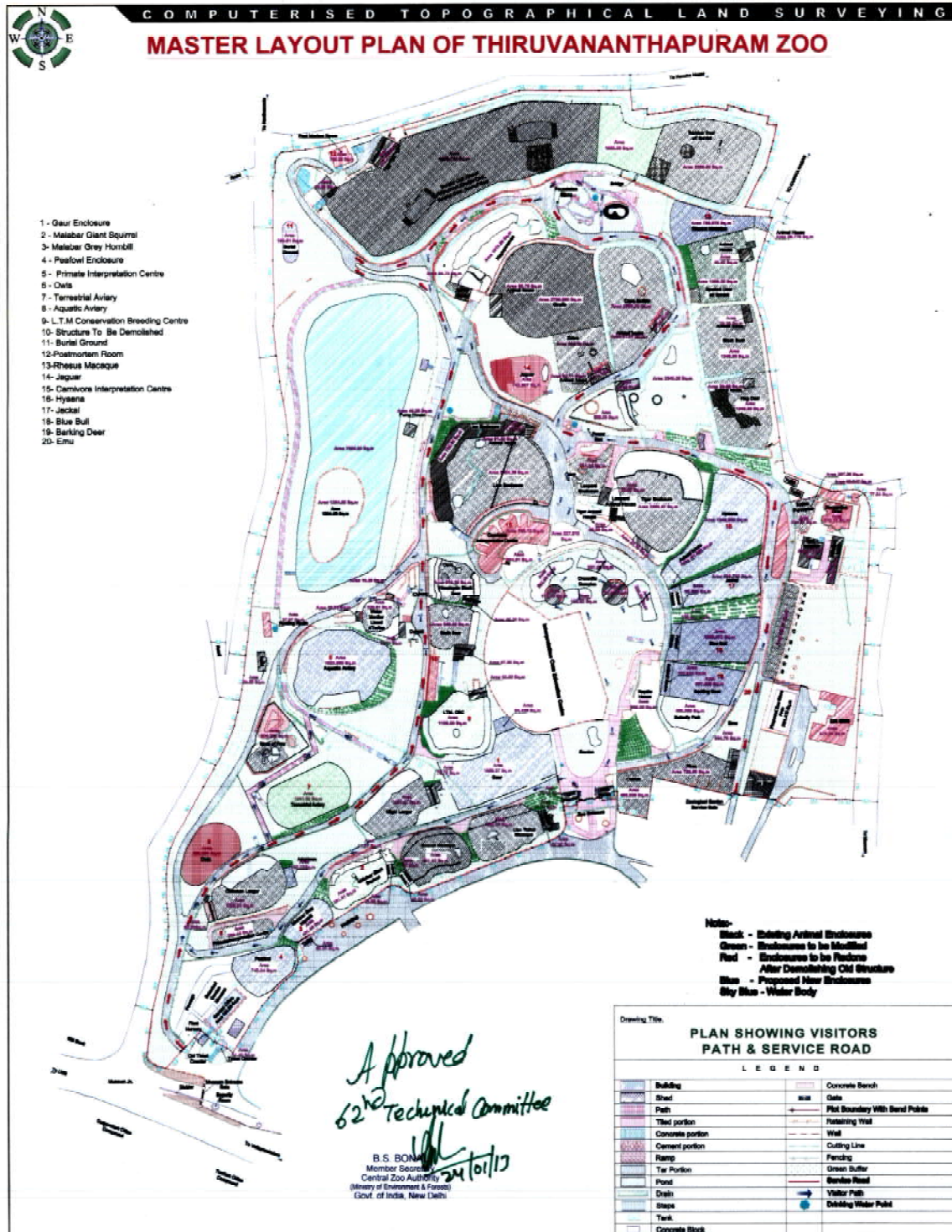
Sl. no.	Species	Number
15	Iguana	1
16	Star tortoise	1
17	Indian black turtle	6
18	Indian flap shell turtle	1
Africa: Mammals		
1	Cape buffalo (1:3)	4
2	Hippopotamus (2:5)	7
3	Zebra (0:1)	1
Africa: Birds		
1	African grey parrot (2:2:1)	5
2	Blue crowned pigeon (2:1:1)	4
3	Hartlaub's turaco (1:1)	2
4	Livingston's turaco (2:1)	3
5	Violet turaco (0:1)	1
6	Ostrich (3:0)	3
Australia: Birds		
1	Palm cockatoo (1:0)	1
2	Emu (1:1)	2
3	Eclectus parakeet (1:1)	2
Americas: Mammals		
1	Jaguar (1:1)	2
Americas: Birds		
1	Black swan (1:2:1)	4
2	Blue and yellow macaw (1:1)	2
3	Blue crowned pigeon (2:1:1)	4
4	Green-winged macaw (1:1)	2
5	Greater sulphur-crested cockatoo (1:0)	1
6	Hartlaub's turaco (1:1)	2
7	Rhea Brown (1:1)	2
8	Rhea White (1:1)	2
9	Salmon crested cockatoo (1:1)	2
10	Scarlet macaw (1:1)	2
11	Sun conure (4:3:3)	10
12	Yellow-collared macaw (0:1)	1
13	Orange-winged amazon (1:1)	2
14	Vulturine guinea fowl (1:1)	2
Americas: Reptiles		
1	Spectacled caiman	11

Annex 3
Rates for adoption of different animals

Sl. no.	Name of the animal	Rate per year (₹)
1	Langurs and macaques	18,000
2	Bears	1,00,000
3	Hippopotamus	2,80,000
4	Rhinoceros	3,36,000
5	Elephant	6,21,000
6	Nilgai	1,13,000
7	African Cape buffalo	1,46,000
8	Indian buffalo	1,46,000
9	Zebra	1,30,000
10	Blackbuck	20,000
11	Spotted deer	27,000
12	Hog deer	31,000
13	Emus	62,000
14	Ostrich	1,03,000
15	Rhea	22,000
16	Peacock	3,000
17	Cinereous vulture	1,00,000
18	King vulture	50,000
19	Adjutant stork	5,000
20	Painted stork	9,000
21	Rosy/grey pelican	21,000
22	Spoon bill/white ibis	7,000
23	Grey heron	9,000
24	Pariah kite/brahminy kite	5,000
25	White-bellied sea eagle	13,000
26	Pheasants	1,000
27	Bengal tiger	5,30,000
28	Lion	5,30,000
29	Leopard	2,30,000
30	Jaguar	2,30,000

Annex 4

Master Layout Plan approved by the Central Zoo Authority



ZOO AREA
MUSEUM COMPOUND
THIRUVANANTHAPURAM

ALL DIMENSIONS IN METERS

Total Area: 26 Acres (10,200 Cents)
 Scale: 1cm = 10 mtrs
 Date: 09-04-2009
 Client: K. Sadasivan/Plam. Director
 Surveyor: M. S. S. Sridharan
 Drawn: L.J.

Checked: Toby Martin
 Insp./Sd/No: 2673-MR-09042009-01

Seal & Signature



email: info@archtechsurveyors.com
 web: www.archtechsurveyors.com

Annex 5

Recommendations for modernization of the Zoo Hospital

The following equipment needs to be purchased for improving the functioning of the Zoo Hospital:

1. Ophthalmoscope for examination of eye.
2. Otoscope for the diagnosis of disorders of the ears.
3. Blood gas analyzer, which will be of help as a major tool to assess the condition of the ailing animal, particularly during surgeries.
4. Electronic amplifying stethoscope.
5. Animal transport-cum-recovery trolley.
6. Zoo Ambulance: In many circumstances, the ailing captive animals are treated or immobilized and minor surgeries are performed in the enclosure itself. A mobile veterinary ambulance with hydraulic lift, having provisions to hold clinical examination table, x-ray machine, ultrasound scan, ECG, oxygen cylinder, immobilizing equipment may be provided to the effective functioning of the veterinary wing.

Modifications in Necropsy Room

The necropsy room will be modified to perform necropsy of all kinds of animals and should be well-lit, well ventilated, fly-proofed and equipped with necessary electrical fittings and glazed tiles to facilitate easy cleaning and disinfection. Modern post-mortem kit will be purchased.

Modifications in the Quarantine Area

The quarantine area houses the new arrivals brought to the Zoo for a specified period of time to evaluate and monitor their health status by clinical examination and laboratory investigation and to rule out contagious diseases. These animals are given prophylactic and curative treatment before being exhibited. The animals are held in a separate facility and cared for by keepers who are not in charge of other animals. The quarantine area should be completely segregated from the hospital and other areas with a separate entry and exit. At present, the quarantine facility can handle large carnivores (lion, tiger and leopard), primates, small mammals and birds. The facility can be extended to house other species like herbivores, reptiles, aquatic birds and nocturnal animals.

Annex 6
Animal mortality in Thiruvananthapuram Zoo (2010-11 to 2014-15)

Sl. no.	Animal	Cause of death (number died & gender)
1	African Grey Parrot	Predator attack (1F)
2	Blackbuck	Enteritis (1M)
3	Barking Deer	Infighting (1F, 4M)
4	Black-necked Stork	Multi-organ failure due to old age (1M)
5	Black-necked Swan	Septicaemia (1M)
6	Black Swan	Cardiac failure due to old age (1F)
7	Black Turtle	Pneumonia (1M)
8	Blue Crowned Pigeon	Shock (2M)
9	Capuchin Monkey	Cirrhosis due to old age (1F)
10	Carolina Duck	Enteritis (2M)
11	Civet Cat	Impaction (1F)
12	Common Marmoset	Enteritis (1M)
13	Crocodile	Snake bite (1M)
14	Crusted Duck	Enteritis (1F)
15	Eclectus Parakeet	Predator attack (1M)
16	Elephant	Pneumonitis (1M)
17	Golden Pheasant	Lung tumour (1F)
18	Green Ring-necked Pheasant	Multi organ failure (1M)
19	Green-winged Macaw	Acute bronchopneumonia (1F)
20	Grey Heron	Multi-organ failure & pneumonitis (1M)
21	Hartlaub's Turaco	Pneumonitis (1F)
22	Himalayan Black Bear	Nephritis (1F)
23	Hippopotamus	Shock (1F, 1M)
24	Hog Deer	Cardiac failure due to old age (1F)
		Infighting (2M)
		Predator attack (2F)
		Asphyxia (1F)
		Gastroenteritis (1M)
		Predator attack (1F)
		Haemorrhagic enteritis (1M)
		Infighting (1F)
		Old age (1F)
		Haemorrhagic enteritis (1F)
		Infighting (1M)
		Shock (1F)
		Enteritis (1M)
		Impaction (1F, 1M)
		Acute bronchopneumonia (1F)
		Asphyxia (1F, 1M)
		Infighting (1M)

Sl. no.	Animal	Cause of death (number died & gender)
25	Hyena	Uterine rupture (1F) Septicaemia (1F, 1M) Bloating (1M) Shock (1F, 1M) Gastric impaction (1F) Canine distemper (1M) Megaesophagial and cardiac failure (1M)
26	Iguana	Intestinal block (1U)
27	Indian Gaur	Cancer & cardiac failure
28	Jackal	Pneumonia & multi-organ failure due to old age (1F) Canine distemper and multi-organ failure due to old age (2F, 2M) Euthenized (2F, 2M)
29	Jungle Cat	Congenital diaphragmatic hernia & malformed limbs (1U)
30	Kalij Pheasant	Mycotic pneumonitis & old age (1F)
31	Kenyan Crested Guinea Fowl	Shock (1M)
32	King Cobra	Multi-organ failure and impaction (1F)
33	Lady Amherst's Pheasant	Haemorrhagic enteritis (1M) Infighting (1M) Predator attack (1F)
34	King Vulture	Multi-organ failure due to old age (2M)
35	Leopard	Acute gastroenteritis (2F, one cub) Pneumonitis (1M)
36	Lion	Cancer & multi-organ failure (1F) Multi-organ failure (1F, 1M)
37	Lion-tailed Macaque	Acute haemorrhagic pneumonitis & multi organ failure (1M) Myocardial infarction (1M)
38	Livingston's Turaco	Infighting (1F, 1M) Predator attack (1F, 1M)
39	Malabar Grey Hornbill	Predator attack (1F)
40	Mandarin Duck	Pneumonia (1M) Enteritis (1F)
41	Mute Swan	Haemorrhagic enteritis (1F, 2M) Haemorrhagic enteritis (1M) Visceral gout (1F)
42	Nilgai	Acute aspiration pneumonia (1M) Cardiac failure due to old age (2F)
43	Painted Stork	Aspergillosis (1F) Infighting (1M)
44	Palm Cockatoo	Choked aspiration (1F) Shock (1F)

Sl. no.	Animal	Cause of death (number died & gender)
45	Peafowl	Infighting (2M)
46	Porcupine	Oophoritis (1F)
47	Rose-ringed Parakeet	Multi-organ failure due to old age (2F)
48	Sambar Deer	Predator attack (1F)
		Fracture of the neck (1M)
		Infighting (7F, 6M)
		Multi-organ failure due to old age (2F)
		Old age (2F)
		Pneumonia (1F)
		Pneumonitis (1F)
		Septicaemia (2F, 1M)
		Shock (3F, 1M)
49	Sand Boa	Multi-organ failure due to old age (1U)
		Pneumonitis (1F, 1M)
		Pneumonia (1M, 1U)
		Scale rot & septicaemia (1M)
50	Silver Pheasant	Acute coli septicaemia (1M)
		Shock (2M)
		Ulcerative enteritis (1M)
51	Silver Golden Pheasant	Infighting (1M)
52	Sloth Bear	Infighting (1F)
		Multi-organ failure from old age & pneumonitis (1F)
53	Spectacled Caiman	Ecdysis (1F)
		Faecolith (1F)
		Infighting (1M)
		Oophoritis and peritonitis (1F)
54	Spotted Deer	Acute broncho pneumonia (2M)
		Infighting (5F, 8M)
		Liver cirrhosis (1F)
		Liver cancer (1F)
		Multi-organ failure due to old age (1F)
		Pneumonia (1F)
		Pneumonitis (1F, 1M)
		Pneumonitis & hoof infection (1F, 1M)
		Prolapsed rectum & colon (1M)
		Septicaemia (1M)
		Shock (2F, 2M)
		Suppurative arthritis & pneumonitis (1M)
		Suppurative arthritis and broncho pneumonia (1M)
		Suppurative pneumonitis (2F, 4M)
		Toxemia & peritonitis (1F)
		Uterine rupture (1F)
55	Sulphur Crested Cockatoo	Infighting (1F)

Sl. no.	Animal	Cause of death (number died & gender)
56	Sun Conure	Infighting (2F) Nephrosis (1F) Shock (2F, 1M)
57	Tiger	Intestinal block (1M) Jaundice (1F)
58	Trinket Snake	Pneumonia (2U)
59	Viper	Pneumonia (1U) Shock (1F, 1M)
60	Vulturine Guinea Fowl	Enteritis (1M)
61	White Peafowl	Pneumonia (1M)
62	White Rhea	Infighting (1F)
63	Yellow-collared Macaw	Shock (1M)
64	Yellow Golden Pheasant	Infighting (1M)

Annex 7
Suggested staffing of Thiruvananthapuram Zoo

Sl. no.	Designation	Strength	Classification	Responsibility
1.	Director	1	Class 1	Officer in charge of all museums and zoos in the state
2.	Superintendent	1	Class 2A	Officer in charge of the zoo.
3.	Curator	3	Class 2B	Assists the superintendent in the daily functions of the zoo as the field manager
4.	Supervisor	5	Class 4	Supervises the work assigned to the Animal Keepers
5.	Animal Keeper	50	Class 4	Upkeep of animals
6.	Sanitation Worker	4	Class 4	
7.	Carpenter	2	Class 4	
8.	Mason	2	Class 4	
9.	Blacksmith	1	Class 4	
10.	Driver	3	Class 3	
11.	Van Cleaner	1	Class 4	
12.	Peon	2	Class 4	
13.	Education Officer	1	Class 2A	
14.	Biologist	1	Class 2A	
15.	Sr. Veterinary Officer	1	Class 2A	
16.	Veterinary Officer	1	Class 2A	
17.	Livestock Inspector	2	Class 3	
18.	Laboratory Technician	2	Class 3	
19.	Laboratory Assistant	1	Class 3	
20.	Bellows boy	1	Class 4	
21.	Welder	2	Class 4	

